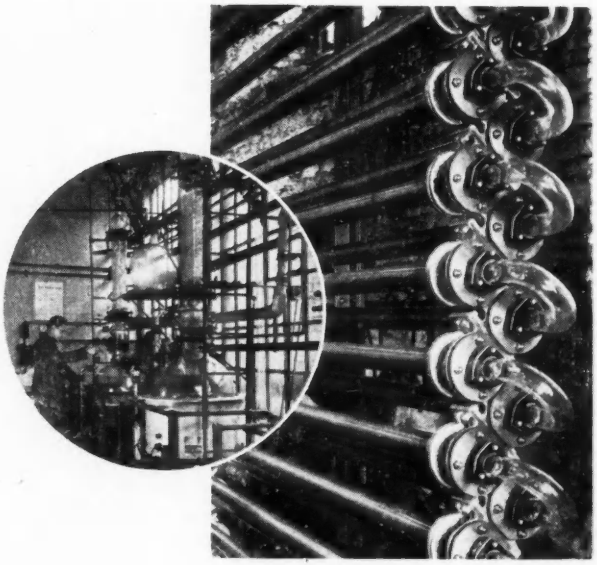
THE Chemical Age

VOL. LXX 10 APRIL 1954 No. 1813

An orchestra or choir which comes under the control of Sir Malcolm Sargent may count itself lucky. For then its work is not subject to storms of temperament or temper, but to the steady discipline and attention to detail which are as vital to an artist as they are to a technician. Indeed, in Sir Malcolm these two personalities combine to make one superb musician. *Achievement in our time* comes only as it always came—by mastery of technique based on knowledge and devotion. It is our conviction that this can also mark the attitude of a chemical house on which the health of men and the progress of industry depend.



QUICKFIT *Visible Flow*

Two examples of Q.V.F. installations

Make it in Glass

Our experts are at your disposal upon any phase of the application of glass to any manufacturing problems

Free yourself of corrosion.
Give yourself visual control of what you make and infinitely better facility for cleaning.
"Quickfit" industrial plant and Visible Flow "Pyrex" brand pipeline combine to make complete all-glass manufacturing units.

Q.V.F. LIMITED,
MILL STREET, STONE, STAFFS.
Phone : Stone 511

Rover Car Factory, Solihull. High intensity lighting in a body spray tunnel by fluorescent lamps in a glazed enclosure.

Tailored for the job

The lighting of many processes is vital to the smooth and rapid flow of work and to the quality of the finished product. For example, poor lighting could make a spray tunnel into a bottle-neck — each job taking a little too long, a little portion missed, a return to the spray line — and so the whole production line marks time. Whatever form it takes, good lighting not only helps to provide a satisfactory working environment but is an active production tool.

Fluorescent lighting is as good as daylight — only more consistent. It is efficient; it is economical; and it is *flexible*. You can ' tailor ' it, easily and exactly, to the special requirements of production at all stages.

HOW TO GET MORE INFORMATION

Your Electricity Board will be glad to advise you on how to use electricity to greater advantage — to save time, money, and materials. The new Electricity and Productivity series of books includes one on lighting — " Lighting in Industry ". Copies can be obtained, price 9/- post free, from E.D.A., 2 Savoy Hill, London, W.C.2, or from your Area Electricity Board.

Electricity for PRODUCTIVITY

Issued by the British Electrical Development Association

BERK DELIVERY
COVERS THE COUNTRY

Ask Berk

FOR CHEMICALS

Highest quality backed by efficient willing service

Phone :
CHAncery 6041
(16 lines)

F. W. BERK & Co., Ltd.

COMMONWEALTH HOUSE,
1-19, NEW OXFORD ST., LONDON, W.C.1.

Branches at
81, FOUNTAIN STREET, MANCHESTER, 2.
65, WEST REGENT STREET, GLASGOW, C.2.
40, QUEEN STREET, BELFAST, N.I.
MORRISTON, Nr. SWANSEA, S. WALES.

Volume LXX
Number 1813

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : CENTRAL 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

CONTENTS · 10 APRIL 1954

Editor : E. A. Running *Publisher & Manager : John Vestey*

MIDLANDS OFFICE : Daimler House, Paradise Street, Birmingham
Phone : Midland 0784/5

SCOTTISH OFFICE : 116, Hope Street, Glasgow, C.2
Phone : Central 3954/5

LEEDS OFFICE : Martins Bank Chambers, Park Row, Leeds, 1
Phone : Leeds 22601

SINGLE COPY 1/- (BY POST 1/3) ANNUAL SUBSCRIPTION 42/-

Background to the Budget

IT HAS become the custom of Chancellors to present not only the time-honoured April budget with its ready impact upon private purses and pockets, but also, a few days before this, a sober survey of the nation's economic health and strength. Mr. Butler has shown himself to be as much an enthusiast for the sideline survey as the late Sir Stafford Cripps. 'Economic Survey 1954' (HMSO, 54 pp., 1s. 6d.) is just another runner from the same stables that has produced the other post-war economic surveys, the only change in fundamental nature being that Mr. Butler is a trainer from another school. Many more people will study the Budget than those who bother to read the Survey, for the one is an event with subjective reactions and the other is mainly a commentary with objective implications. For all that, the Survey is the true measure of our national economic health and the maneouvres of a Chancellor in his Budget changes are no more than the marginal symptoms of well-being or ill-being.

This year a careful study of the Survey is essential if one is to be fair to the Chancellor. No section of the community can be said to be pleased with Mr. Butler's proposals and yet a careful study of the situation forces one to admit that he has perhaps acted wisely in adopting a policy of 'wait and see.' Too often fools (and politicians) rush in when wise men would hesitate. As the Federation of British Industries has said: 'Within the limits of existing levels of Government expenditure, the Chancellor has done the best he can to stimulate industrial efficiency and expansion.'

The 1954 Survey is in two sections, a review of 1953 and a prospect for the year to come. The review is certainly to be described as heartening although it also has its danger-points. 1953 was a year of stable world trade and in these conditions both the United Kingdom and the sterling area as a whole were able to consolidate the progress made in 1952. It is worth recalling that four or five years ago many responsible people gravely feared the effects of transition from a sellers' to a buyers' market; this transition, inevitably to be faced at some stage in the world's post-war journey, was fraught with disastrous and insidious possibilities for Britain and sterling. As it turned out, the Korean crisis suddenly (and some might say almost hysterically) reversed this state of gradual transition just when it was starting, and it was not until later 1952 and 1953 that world markets settled down again to evolutionary rather than revolutionary rates of movement. There has not been, therefore, that slow transition from scarcity to plenty that many people expected. Instead, there was a pre-Korean beginning, then a sharp burst of renewed scarcity and over-stocking, and then a much hastened transition towards the buyers' market, hastened by the running-down of panic-built stocks. It is a great achievement that 1953 has brought a considerable rise in our gold and dollar reserves, and only a small drop in our current account balance of payments as compared with 1952 (£225,000,000 as against £255,000,000). To point this out is not to encourage complacency; but we can weaken our prospects far more by preaching doubt and despondency. Our first full taste of the buyers' market has been much less toxic and even less bitter than most of the experts foretold.

It is true enough that we must export to live. Equally, however, we must import to live. The effects of a buyers' market in world trade cut both ways. In 1953 we exported just above 3 per cent more in volume of goods than in 1952 but we received about 1 per cent less in payment. We imported 9 per cent more

in volume in 1953 than in 1952, and in fact paid 4 per cent less for this appreciably greater quantity of goods. So far, then—and it is, indeed, a case of *so far* —we have been aided rather than handicapped by the development of the buyers' market. For the immediate future, the extent of recession in United States' industrial activity is regarded as the most decisive influence upon world trade conditions. This is in one sense an external influence that we cannot control; in another sense, it is an influence whose effects we can hope to mitigate. It is emphasised in the Survey that the effects of US recession can be more sharply felt by other countries in the sterling area than by the United Kingdom. Sterling area progress during 1953, particularly the building up of hard currency reserves and steady development of resources, has already created a useful shock absorber. At the same time, there is no sign that US recession, though indeed a fact, is more than mild. Unless there is some abruptly violent change, whose shock cannot be safely absorbed and which leads world trade downwards in a spiral of price and volume contractions, our trading prospects for 1954 can be regarded as even brighter than the actual trading facts of 1953. But Mr. Butler has decided to await these developments before taking action. He has indicated clearly that if the USA recession develops further and new measures are needed, he will not hesitate to take them. On the other hand, if the situation does not worsen all will be well and good. 'Better safe than sorry,' it would seem, is to be his policy.

The threat of keenly reviving competition for exports from Germany and Japan is recognised in the Survey, but it is not exaggerated. Nor, on facts so far available, should it be exaggerated. A chart shows clearly that the value of UK exports of manufactured goods was not at any time in 1953 reduced because throughout most of 1953 the value of German exports was rising impressively. However, it is stated frankly enough that 'recent price trends in export markets certainly offer no room for complacency.' We are managing to hold our own—and again the qualifying words *so far* should be added. Our ability to go on doing so depends upon keeping the costs of our exports down. This means continued improvement in productivity, but also that the benefits of greater output are not overshadowed by rises in wages, salaries, and profits. However, entire responsibility is not laid upon moderation in wages and profits payment. A rather welcome note for a Treasury document is sounded when it is pointed out that the United Kingdom lags behind its principal world competitors in the level of investment in modern machinery, scientific discovery, and new manufacturing techniques. The repeal of the excess profits levy and the return of the initial allowance in Mr. Butler's 1953 Budget were small but useful devices of guidance in that direction. In his current proposals he has gone a step forward. His new tax-free investment allowance, which replaces the initial allowance system, should go some way to promote capital re-equipment.

Industry has been well served by the Chancellor and while some people might have welcomed bolder action there can be no great criticism. For many years to come much more capital expenditure by industry will be necessary if Britain is to increase her productivity and hold her own against overseas competition. Mr. Butler's Budget was designed to increase incentive to production without taking undue risks. Twice during his speech in the Commons on Tuesday the Chancellor made it clear that if the need arose he would make new Budget proposals later in the year. The future is 'necessarily uncertain' but as the Survey shows the prospects are not unfavourable. If conditions do not worsen it is safe to assume that further aid and encouragement will be forthcoming from Mr. Butler. Industry feels that taxation as a whole remains far too high and that it is hindering its efforts. Both the investment allowance and the easing of the burden of estate duty on family businesses are welcome. The chemical industry particularly welcomes the announcement that plant and building used for scientific research shall rank for the new investment allowance. While agreeing that Mr. Butler's caution was not entirely uncalled for in the circumstances it is to be hoped that he will be able to do more in the autumn.

Notes & Comments

Antibiotics as Plant Sprays

AN important decision is reported to have been made by the US Food and Drug Administration. This powerful organisation will apparently not attempt to regulate the use of antibiotic substances as disease-control sprays for crops. The view taken is that when an antibiotic is thus used it is classifiable as a pesticide, not as an antibiotic. Any regulating activities will therefore have to be carried out by the US Department of Agriculture. This does not mean that the FDA is without all responsibility. It still controls the residue problem for it sets limits for permissible contamination on all foodstuffs. Thus, it was FDA action over DDT in milk and milk-derived products that in effect drove DDT out of US dairy farming; when FDA announced that it could allow no tolerance for DDT in these farm products, the use of DDT as a spray for milk-producing cattle and fodder crops became virtually impossible. However, where antibiotics have so far been used in spraying trees the subsequent fruit harvested has been found free from antibiotic residues.

Interesting Race Possible

THE extent to which antibiotics, at any rate those already known for their medical virtues and produced in reasonable quantity, will be useful in disease or pest control for crops is still exceedingly difficult to assess. Some good results have been claimed, but the subject is very young and successes are somewhat scattered. Most of the work seems to have been carried out in the United States, the natural consequence of having a powerful and wide-ranged antibiotics industry. Development has probably been inhibited by fears that government bodies would take a cautious view in sanctioning any spray applications of antibiotics; the easement of these fears may now be followed with greatly intensified activity. US industry rarely rejects the competitive 'trial-and-error' race for development so long as there is some reasonable chance that a prize is waiting for the winner, and with agricultural chemicals these development races have usually out-paced basic research. There may soon be plenty of other countries to watch, especially in the fungicide field.

Thermenol, a New Alloy

THE US Naval Ordnance Laboratory claims to have discovered a new and revolutionary alloy. It has high resistance to heat and corrosion, an electrical resistivity 50 per cent greater than that of metals now used in heating elements, is 20 to 25 per cent lighter than stainless steel, and may be cheaper to make. It has been given the name Thermenol. Discovery was not the result of a planned research programme; rather, it occurred as the result of a 'hunch' diversion. Testing another alloy, Alfenol, metallurgists at the NOL observed its high heat-resisting properties, and decided to see what happened if a similar alloy was made without using critically scarce metals like nickel, chromium, or cobalt. Thermenol, an iron-aluminium alloy to which small amounts of vanadium and molybdenum are added, was the result.

Questions Still Unanswered

WHETHER Thermenol will take the place of any of the high-temperature alloys now used in jet engine construction is still a matter for investigation. The prospects would seem to be promising. For heat-loads that are not quite as critical, the alloy is already being called 'a natural,' for a very high proportion of its 'cold' strength is maintained when hot. However, Thermenol will require its own manufacturing process; existing plant for alloy-production will require some modification. Before Thermenol can seriously compete with stainless steel, its own mass-production flow-line will have to be set up. To what extent the new alloy will be useful in chemical plant manufacture seems rather obscure at present. Although the information already made available includes the statement that Thermenol has high resistance to cor-

rosion, this particular property has been described in less detail than others. However, it is not only a new alloy that has been discovered, but a completely new family; for the four component mixtures of Fe-Al-V-Mo will provide many variations to be investigated.

Zirconium Chemistry

A NOTABLE US paper by Warren Blumenthal of the National Lead Co. (*Industrial & Engineering Chemistry*, 1954, **46**, 528) has achieved a new and badly needed systematisation of zirconium's chemistry, hitherto predominantly expressed in empirical fashion and not without an unusual quota of confusion and contradiction. Indeed, in view of the increasing diversity of uses steadily developed for zirconium and its compounds over the past 10 or 20 years, the scanty presentation of their fundamental chemistry is remarkable. It is also remarkable that the lead has now come from an industrial chemist rather than from academic circles. The situation seems to be the inverse of that for silicones, studied fundamentally by Kipping of Nottingham for over 40 years, a contribution to pure chemistry that almost precisely preceded the first commercial development.

A Milestone of Clarification

FOR zirconium Blumenthal lists the basic knowledge that is free from contradiction and which forms rules of behaviour that the element and its compounds consistently follow. On these 'key rules' and from corollaries that can reasonably be deduced from them, he bases a comprehensive account of zirconium chemistry developed to the kind of level one would expect to find in a fairly advanced text-book. Distinction between valence bond compounds and co-ordinated compounds is emphasised for the literature is well stocked with 'zirconium-containing reaction products' that often fail 'to show the compositions expected from the laws of constant proportions and of stoichiometry.' Divalent and trivalent zirconium compounds are rare; almost invariably the four active valencies are fully engaged. But the zirconium atom may also realise valencies of 5, 6, 7, and 8 by additional co-ordination, and the maximum amount of co-ordinate engagement that is sterically possible is likely to occur. Reactions involving the co-ordination covalencies may proceed so slowly that completion is not reached for long periods of time, even running into years! This no doubt accounts for much of the confusion in the existent literature. However, it is not the purpose of this brief comment to attempt an abstracting task. The paper must be read in full for it is one of those milestones of clarification that should bring far-reaching blessings to student and specialist alike. It should greatly stimulate further research on the chemical behaviour and practical usefulness of this abundant but classified-as-rare metal.

The First Polychromator

DESIGNED for the rapid routine analysis of complex metallic alloys, a direct-reading spectrograph known as a polychromator is now being produced by Hilger & Watts Ltd. The first one has been installed with I.C.I. (Metals Division) at Birmingham.

Announcing this at the recent annual meeting of Hilger & Watts, the chairman, Mr. G. A. Whipple, said the instrument is entirely automatic; all the operator has to do is to insert a specimen of the metal to be analysed into the spark stand and press a button. Figures for the analysis, which can be for up to 30 elements at one setting, are printed automatically on a strip of paper. A typical time for one 'run' in which 15 elements, selected at will, are measured, is two minutes 40 seconds. The advantages which such instruments give to the user arise through the accuracy and rapidity of the analyses. The time is sufficiently short for important alloys to be held in the molten state while their exact chemical constitution is checked and if necessary additions made to correct the liquid metal before pouring.

Record Volume of Business

Grangemouth, the Scottish oil, chemical and pharmaceutical port, did a record volume of business in 1953, handling 4,000,000 tons of goods.

Heavy Chemical Industry & Production

Further Progress made by ABCM Committees

IT will be recalled that in November last year the Association of British Chemical Manufacturers issued a progress report on the steps which had been taken to implement the recommendations in the report of the Heavy Chemicals Productivity Team which visited the USA in 1952 (see THE CHEMICAL AGE, 1953, **69**, 1081).

The present position is indicated in a further report issued by the ABCM this week. This states that the steering committee and the six area committees have continued their activities and the third series of meetings is now under way. The various firms who are affected by the report have nominated high level managerial liaison contacts for each of their works for the appropriate area committee. About half a dozen of these contacts for firms not already represented on the area committees are being invited at a time to attend meetings of the area committees to discuss the progress they are making in implementing the recommendations and the problems and difficulties they are encountering. For the time being discussion is being centred on four main recommendations dealing respectively with technical graduates, instrumentation, work study and materials handling.

A popular version of the report, attractively and simply presented to make an appeal to the shop floor, has been published and is being widely distributed by the firms concerned to all levels in their factories in order to stimulate and sustain further interest and discussion in the team's recommendations in the cause of productivity. The first print of 25,000 is nearly exhausted. Copies are obtainable at 6d. per copy post free from the ABCM at their new address at Cecil Chambers, 86 Strand, London, W.C.2.

Issue of Questionnaire Deferred

The issue of a detailed questionnaire regarding present and future estimates of requirements of technical graduates of all kinds has been deferred until certain aspects of the team's report have been further discussed in order that a realistic forecast of the demand may be ensured. As regards chemical engineers, for whom there is a particularly great demand, the Institution of Chemical Engineers has prepared a comprehensive survey of the facilities available for training at universities and technical colleges and this will be of the greatest assistance to the industry. There is a special need to stimulate the use by industry of the facilities which were created at some nine technical colleges in 1951 for training of employees to obtain higher national certificates in chemical engineering and steps have been taken to this end.

Instrumentation Committee

The ABCM has set up an Instrumentation Advisory Committee to assist firms with their problems and to stimulate and expand the design and production in this country of the requisite instruments. Active consideration of this important problem has been stimulated by the publication of two valuable papers on the subject by Mr. Young, head of the I.C.I. instrument group, and Professor D'Ombrain, of the Battersea Polytechnic respectively.

This committee is constituted as follows: Mr. W. A. Goldstein, chief instrument engineer, Bakelite Ltd.; Mr. S. F. Grover, chief instrument engineer; Associated Ethyl Co. Ltd.; Mr. E. W. R. Little, chief instrument engineer, The Distillers Co. Ltd.; Mr. E. I. Lowe, group instrument engineer, Imperial Smelting Corporation Ltd.; Mr. H. Slack, senior instrument engineer, British Petroleum Chemicals Ltd.; Mr. E. A. Wimberley, engineering group manager, A. Boake, Roberts & Co. Ltd.; and Mr. A. J. Young, head of the instrument section, I.C.I. Ltd.

As stated in THE CHEMICAL AGE last week (p. 770), the proceedings of the Work Study Conference held at Buxton last year has now been published and in order to provide further stimulus the ABCM has appointed a Work Study Advisory Committee.

With regard to materials handling, the ABCM states that reports issued by other productivity teams on this subject have created so much interest and activity in the industry that so far it has not been found necessary to take any further steps in the matter. Action is in hand on other recom-

mendations, however. A joint committee of the ABCM and the British Chemical Plant Manufacturers' Association is studying the problems of standardisation of chemical plant and equipment in the widest sense. Standard costing has created great interest and two papers on it by members of the Association have been in great demand.

Canadian Fertilisers

Mining Companies Increase Output

FERTILISERS have become big business to Canadian mining and are growing in importance. Production is rising, while planning in certain new mining developments is designed to capitalise upon the big domestic and foreign markets.

So far, Consolidated Mining & Smelting is the only Canadian mining company to capitalise on the fertiliser market in a big way. The firm recently completed a $17,000,000 programme to modernise and extend its fertiliser facilities. Sherritt Gordon will soon join the field—some 70,000 tons of ammonium sulphate fertiliser will be produced annually as a secondary product of the company's new nickel refinery at Fort Saskatchewan.

With Consolidated Mining & Smelting's expanded capacity rated at 700,000 tons annually, it can be seen that output from Canadian mining companies is heading toward the 1,000,000-ton mark. This is a dramatic leap from the 140,338 tons produced by Consolidated Mining & Smelting in 1940, or the 25,056 tons produced in 1931 when the firm first went into the fertiliser business.

Additional large-scale production of chemical fertilisers seems in prospect from the domestic mining industry, but it probably will be a number of years before it materialises. It seems certain that a chemical industry will be born with the development of a metals treatment industry in New Brunswick, and conceivably fertiliser production would be a segment of this.

More interesting are the possibilities in the Sudbury area where construction of the Trans-Canada pipeline will bring a supply of natural gas to the nickel centre. This, in conjunction with a ready supply of sulphur gases from the area's smelter operations, stimulates the possibilities for expansion of the chemical industry which already has been born there.

Substantial capital has been committed to the investigation of apparently large apatite-magnetite deposits at Nemegos at the north end of the Sudbury mining division. The apatite would be a source of phosphate, which would round out the raw material requirements for fertiliser production.

In the case of Sherritt-Gordon, fertiliser production will be an integral part of the nickel refinery operation, and this is likely to be the case when a chemical industry is developed in the Maritimes.

OCCA Exhibition

THE sixth technical trade exhibition of raw materials and equipment used in the paint, varnish and printing ink industries, organised by the London Section of the Oil & Colour Chemists' Association, will be officially opened by the president of the Association, Mr. H. Gosling, at 3 p.m. on 21 April in the Royal Horticultural Society's Old Hall, Vincent Square, London, S.W.1.

On the same day, a luncheon will be held at the Criterion Restaurant, Piccadilly, at 12.45 p.m. The chairman of the London Section of the Association, Mr. R. F. G. Holness, will welcome visitors and exhibitors, and responses will be made by the president, Mr. H. Gosling, and by the chairman of the British Colour Makers' Association, Mr. A. S. Callaghan, of I.C.I. Ltd., on behalf of the exhibitors.

The following have also accepted invitations to attend the luncheon: the president of the National Paint Federation, Mr. R. Ashley Hall; the president of the Federation of British Printing Ink Manufacturers, Mr. G. D. Dane; the director of the Paint Research Association, Dr. L. A. Jordan; and the director of the Printing, Packaging and Allied Trades Research Association, Dr. G. L. Riddell.

The exhibition will open as follows:—21 April, 3-8.30 p.m.; 22 April, 2-8.30 p.m.; 23 April, 2-7.30 p.m. Descriptive brochures of the exhibition, including a plan of the lay-out of the hall and general information, may be obtained from Mr. R. H. Hamblin, general secretary, Oil & Colour Chemists' Association, Memorial Hall, Farringdon Street, London, E.C.4.

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Use of Soap Films in Gas Analysis

AT a meeting of the Midlands Society for Analytical Chemistry, held recently in Birmingham, Mr. W. J. Gooderham, of the Fulham Laboratory, North Thames Gas Board, read a paper entitled 'The Use of Soap Films in Gas Analysis and Gas Calorimetry.'

In 1940, Mr. Gooderham had pointed out[1] that 'given a series of accurate gas meters, which do not appreciably absorb gas or cause loss of pressure, the simplest form of gas analysis can be obtained by passing gas through a meter, a reagent to remove completely one constituent of the gas, another meter, another reagent, another meter and so on. Gas analysis then becomes a matter of reading gas meters.' Since then, improvements have been made to the apparatus.

The first apparatus[1] employed a stop watch to time soap films moving down graduated tubes, the second[2] had a 'stop and start' mechanism, which enabled analyses to be obtained directly in percentages, while the third[3] made improvements to the 'stop and start' process. Other papers described the use of soap films in small scale gas calorimetry[4], in assessing the efficacy of gaseous combustion[5] and in an apparatus equivalent to the Haldane for the determination of carbon dioxide, oxygen and carbon monoxide in waste gases[6].

Gas Analysis Apparatus

(*a*) *Use of apparatus.*—The present soap film gas analysis apparatus is essentially the same as that described in 1948[3] except that the makers have lowered costs in producing a bench model. Other 'home-made' forms of this apparatus have now been in use in the Fulham Works for the past twelve years. They have been very satisfactory and some comments on their use may be of value.

Six different gases may be available at Fulham; each of these is sampled at a constant rate over a period of about twenty hours into a 10 cu. ft. water-sealed gas holder. Each holder is used only on one gas stream so that the water becomes saturated with that gas. At the end of the sampling period, the calorific value is determined with the Boys' calorimeter and the gas is analysed on the soap film apparatus. The carbon densities of the saturated (x) and unsaturated hydrocarbons (n) are determined. The correct calorific values at 60° F. and 30 in. saturated can then be allotted from the following relationships:

C.V. (unsaturated hydrocarbons)
$= 780\ n + 19$ B.Th.U./cu. ft.

C.V. (saturated hydrocarbons)
$= 764\ x + 229$ B.Th.U./cu. ft.

Using these and the calorific values for the remaining combustible gases ($H_2 = 318.4$, $CO = 315.3$) the calorific values can then be calculated from the gas analyses and compared with those actually found on the same gas. Good agreement is an indication that the analysis is correct and good agreement is usually obtained.

Some comments on the day-to-day use of the apparatus over a period of years may be a useful addition to the operational details given before[3]. For routine analyses, the apparatus is invaluable. The upkeep is very small; reagents have to be added, the taps have to be cleaned and re-greased perhaps once a month; the copper oxides must be fully revivified every night, water has to be added to the saturators and soap solution to the meters, the blotting paper film breakers have to be replaced every now and then, but otherwise there is little maintenance. Sometimes potassium carbonate may crystallise out and block a capillary or jet and some water may block the main gas control capillary and have to be cleared.

Water may also block or impede the furnace outlets or a bubble cause a gas lock. The same may happen to a scrubber. It is essential in the method that there should be no blockages, however slight, anywhere. Water from the furnaces should flow readily as also should liquids from the scrubbers, so it is essential that the scrubber outlets should not be 'kinked' or partially blocked in any way. The tap bar should be operated quickly so that the gas is kept flowing.

To cut down volumes and hence the time needed to flush out the apparatus, the scrubbers can be made smaller except for that used to remove unsaturated hydrocarbons. It is possible to use packed scrubbers provided they never become choked or partially choked with liquid. It is wise to check that enough air is flowing through the copper

oxides overnight to complete the oxidation within the revivification period. Powder formed in the copper oxide tubes must be removed.

The apparatus requires a little patience to become accustomed to it and some skill to see that all reagents are satisfactory and flowing properly, that the oxide tubes are at the right temperatures and fully oxidised, that there are no blockages and that the soap and water levels are maintained. Otherwise, it is the simplest apparatus to operate and maintain. It is a new tool which analysts have been rather slow to adopt. It is, however, beginning to be used in the gas and oil industries and in Holland, Russia and Australia[7].

The method can be used for all types of gas provided the sizes of the soap film meters are properly adjusted, but, in order to obtain greater accuracy and quicker speeds of flushing out the apparatus, it is preferable that the soap film meters should decrease in size. Six meters of different sizes are sufficient to cover the analysis of most gaseous fuels.

Synthetic Gas Mixture

The soap film apparatus is capable of giving remarkable agreement and accuracy. A synthetic gas mixture was prepared in a gas cylinder by successively adding the following gases in the following order—carbon dioxide, ethylene, methane, carbon monoxide, oxygen-free nitrogen and hydrogen. The gas cylinder was evacuated at the start, a long manometer connected to it permitting pressure readings to be taken after the addition of each gas. The gases deviating most from Boyle's Law were added first, the final pressure being 521 mm. of mercury. The ethylene and methane were purified by liquefaction and distillation from cylinder gases. The methane came from sewage gases and contained no ethane; the other gases, except for hydrogen, were almost pure and came from cylinders. The hydrogen contained 98.8 per cent hydrogen, 0.5 per cent oxygen and 0.7 per cent nitrogen.

The results were better than those obtained in a series of thirty analyses on the constant volume gas analysis apparatus[10] and agreement was better than that obtained in American surveys[11]. The agreement between consecutive analyses was also very satisfactory.

It should be noted that it is possible to photograph the result of an analysis, if a photograph is taken of the films in the top and bottom positions.

It may be as well to restate the advantages and disadvantages of the soap film gas analysis apparatus.

ADVANTAGES

1. Speed: once flushed out, an analysis complete in percentages is obtained in three minutes.
2. Accuracy.
3. Repeats (to 0.1 per cent).
4. No mercury.
5. Taps come into contact only with gas.
6. Solution errors very small.
7. No appreciable dead space.
8. No pressure or temperature corrections.
9. Practically no cleaning.
10. Little danger of breakages.
11. Reagents which attack mercury can be used.
12. No leakage errors.

DISADVANTAGES

1. More gas wanted (2 litres minimum).
2. Long time to flush out.
3. Will not cope with gas streams of fluctuating composition.
4. Not very flexible.

(*b*) *Removal of Unsaturated Hydrocarbons.*—For the analysis of most fuel gases, concentrated sulphuric acid containing 0.6 per cent or more of silver sulphate still appears to be the most suitable reagent, but the rate of flow down the scrubber may have to be adjusted for different gases. If used—and thus diluted—acid is employed again, the strength may have to be made up with a little fuming sulphuric acid containing silver sulphate.

There is no appreciable absorption of pure carbon monoxide with this reagent at rates of flow up to 125 ml. per hr. of the reagent and up to 60 ml. per min. of the gas. As ethylene is usually the most difficult of the unsaturated hydrocarbons to remove, at least with activated acids, some experiments were made with this gas and various reagents, which consisted of a saturated solution of potassium dichromate in concentrated sulphuric acid, a saturated solution of chromic oxide in concentrated sulphuric acid, a 0.6 per cent solution of silver sulphate in concentrated sulphuric acid, and a 0.6 per cent solution of silver sulphate in 25 vol. concentrated sulphuric acid and 3 vol. concentrated nitric acid. The rate of flow of the cylinder ethylene was 1,980 ml. per hr.

It was found that the activated nitrating mixture was very effective but that it was necessary to have a scrubber containing KOH following to remove acid fumes and carbon dioxide. Other reagents tried were iodine in potassium iodide, and bromine water, which removed only 1.6 per cent and

24 per cent of ethylene respectively. For small amounts of unsaturated hydrocarbons up to 5 per cent, such as are present in many fuel gases, a rate of flow of $H_2SO_4 + Ag_2SO_4$ at 80 ml. per hr. appeared to be adequate. Larger concentrations would require greater rates of flow of reagent.

A synthetic gas mixture containing 2.8 per cent of ethylene was also analysed successfully with rates of flow of 60 ml. per hr. of activated sulphuric acid.

(*c*) *Use of Copper Oxide-Iron Oxide.*—A difficulty in the day-to-day and year-by-year use of the apparatus appears to be in the sintering of the copper oxide and copper (Arneil) reagents. Various methods of making them have been tried. They have been pelleted and tableted with and without kaolin and ball clay and have been compressed under moderate and large pressures, but it has been difficult to prevent some powdering. As the oxide is being continually reduced and re-oxidised, this is hardly remarkable.

When tubes have been opened after long usage, evidence of the formation of Cu_2O has been obtained and sometimes the Arneil reagent has turned into a long rocklike stick, which has, however, still been working well. It is difficult to recommend any manufacturing method wholeheartedly. On the whole, preference is given to copper oxide made from wire for the low temperature tube and to an Arneil reagent made as follows: Mix thoroughly 312.8 gm. of CuO, 3.16 gm. of Fe_2O_3, 80 gm. of kaolin and 4 gm. of sodium silicate, all in the form of fine, pure powders. Paste with water, make into 'worms,' dry and fire in a muffle furnace at a good red heat. Break into pellets. If dust is formed, however, it should be removed periodically by removing the tube, blowing out the dust and topping up the oxides with new ones.

Mr. A. Clarkson, at the Fulham Works, has been using an oxidised fine copper gauze at 700-750°. A larger piece of this gauze, made of 32 SWG copper wire with 32 wires to the inch in either direction, was softened by heating, wound tightly into a cylinder and rammed into a straight silica tube or a gas-tight Mullite tube. The end spaces were packed with pieces of refractory brick. Rubber bungs, fitted with glass tubes, were used to lead the gas into and away from the gauze which was oxidised in position. Such a tube has been working satisfactorily for some months.

(*d*) *Ferric sulphide for removal of oxygen.*—Sulphided $Fe_2O_3.H_2O$ is a good solid reagent for removing oxygen from air or waste gases. It can be simply made by adding ammonium carbonate to a ferrous salt, filtering and allowing the ferrous carbonate to oxidise in the air. The filter cake is dried, broken into lumps, graded between 3/16 and ¼ in. and packed into the first four-fifths of a U-tube. The oxide is then sulphided with H_2S from a Kipp and the last fifth of the U-tube packed with a non-deliquescent, self-indicating soda lime of 4 to 10 mesh granules. The latter is necessary as some small amounts of hydrogen sulphide and sulphur dioxide can be formed, especially if the concentration of oxygen is high and the ferric sulphide gets hot. A 15 in. glass tower packed with 658 gm. ferric sulphide was found to remove completely 4 per cent and 10 per cent of oxygen from streams of gas flowing at 1 cu. ft. per hr. A life test was not completed but 14 litres of oxygen were readily removed.

The ferric sulphide is not so good for removing oxygen from coal gas. Many experiments made without the soda lime in the hope that ferric sulphide could be used directly for getting the oxygen content of coal gas showed what is apparently an adsorption effect of about 0.4 per cent of gases, which appeared to be mainly saturated hydrocarbons. Ferric sulphide should not therefore be used on coal gas or other gases containing methane and other paraffins (unless a correction factor can be applied). For waste gases, however, it is admirable[6].

(*e*) *Small Holders.*—One of the disadvantages of the soap film apparatus is that it needs more gas to do an analysis than other types of gas analysis apparatus. For gases containing small amounts of paraffins and nitrogen, it may take an hour or even a little more to sweep out the apparatus. As the rate of flow in Meter No. 1 is 20-30 ml. per min., this means that 2 litres of gas are really required and even then very little 'blow-off' can be allowed. Special gas samplers are therefore required. In an earlier paper[1], the author described one such holder, which was made from corrugated (Taylor) steam jointing rings. In constant use, however, these holders tend to spring

the outer soldered edge and, after a while, begin to leak.

Aspirators containing dilute sulphuric acid have been successfully used but in these cases the acid has been carefully 'conditioned' with the gas and the reservoir aspirator has also been vented to gas. Such aspirator systems, if always used on the same type of gas, can be reasonably successful.

Other Types of Holder

Systems using dry holders are, however, to be preferred. Three other types of holder have now been used. The first was described by L. Silver[12]. This is a carefully made metal holder rising and falling in a mercury sealed annulus. It can be used both for taking in gas samples at a constant rate and for passing them out, also at a constant rate. This latter property is of considerable use for the soap film apparatus. Unfortunately, the holders, especially of the 2 and 3 litre sizes, are not readily transportable.

Holders of the second type are made of Perspex tubing, which has a seam, so that before boring out the tube it was necessary to add two heavy rings. The floating piston has a 'Gaco' ring, one mercury seal and eight guides to keep it straight. Two 'Gaco' sheets, each held between two Perspex discs, prevent mercury and gas from escaping. The holder can be used either way up to suck gas in or to push it out through the gas analysis apparatus.

The third type of holder is an inflatable plastic vessel. One of these was used by members of an International Flame Research team working at Ijmuiden in 1951. This was an 'Air Stop' inner tube made by Michelin, but only in France. It was said to be made of butyl rubber. It was tested with coal gas and carburetted water gas by filling it with these gases and by making analyses at different intervals. An ordinary (natural) rubber tyre was similarly tested.

It was found that each tyre tends to lose C_nH_m and H_2 and to gain in O_2 and N_2, but the 'Air Stop' tyre loses less than the one made of natural rubber, which loses CO_2 as well. It would appear that an 'Air Stop' tyre could be used for storing some gases for reasonably short periods without great changes taking place in the composition of the gas.

Brubaker and Kammermeyer[13] have studied the passage of gases through various plastic membranes. They gave an expression: $q = \frac{PAt\,(p_1 - p_2)}{d}$

where q = gas permeated (ml.) at 0°.
P = permeability constant.
A = area membrane (sq. cm.).
t = time (sec.).
p_1 and p_2 = pressures (cm. mercury).
d = thickness membrane (cm.).

Unfortunately, values of $P \times 10^9$ at 25° for butyl rubber appear to be lacking, but if the present results can be said to indicate a maximum loss of 0.2 per cent per day, $P \times 10^9$ would be about 0.2. This compares with about one for polythene, nine for polystyrene, three for ethyl cellulose, 1.3 for plasticised PVC, 0.1 for monochlorotrifluoroethylene and 0.06 for polyethylene terephthalate polymer.

Some tests were made with sheet 'Gaco,' polythene and PVC, both the latter being unplasticised. Two 21 in. squares of each of these materials were clamped together to make a portable gas holder. Changes in the composition of a town's gas on storage were measured.

It was established from the results that 'Gaco' sheet was fairly satisfactory. Several other modern plastics might also be suitable. Unfortunately, up to the present it has been difficult to get manufacturers to make inflatable vessels of plastics. Such vessels might be similar to the 'concertina' type of holder[1] or to football bladders, but preferably made of thicker materials, and could be used most advantageously in soap film gas analysis. Gases could be allowed to flow in or could be pumped in through governors at constant speeds and, once in, the gas would be under pressure ready for use in the soap film apparatus. There may, however, be a danger in storing some gases. For example, butane stored in an 'Air Stop' tyre appeared to dissolve in the butyl rubber and for a long time afterwards butane was evolved in other gases subsequently stored in the tyre.

Apparatus for Gas Calorimetry

Since 1950[4], several improvements have been made to the portable water-flow gas calorimeter. The soap film meter has been water-jacketed, the taps are operated by a bar as in the gas analysis apparatus, the heat exchange vessel has been re-designed and

[continued on page 834

Half a Million Firelighters a Day

A Problem Solved by A. J. Caddick, M.I.M.M.

DURING the last war it was felt that the amount of wood and paper being used by householders should be reduced, and to achieve this an increase in the use of firelighters was desirable. The writer, who had developed a large scale firelighter manufacturing business for a North East Coast firm of chemical manufacturers, was consulted and proposals were made for the production of 500,000 firelighters per day.

A first consideration was the availability of raw materials, and this indicated that a new approach in regard to the composition of firelighters was necessary as sufficient naphthalene would not be available for the potential demand of firelighters envisaged, if the amount of naphthalene used in many of the firelighters then being made was adhered to.

Special Methods Devised

Ultimately a mixture of pitch, sawdust, wood shavings and creosote, with a small amount of naphthalene as a primer, was found to be very suitable and investigations were continued with this mixture.

As the production of 500,000 firelighters per day, working the full 24 hours, meant some 400 firelighters per minute, special methods of manufacture, handling and plant had to be devised.

Moulding, extrusion and pressing were considered, but ultimately it was decided to use rolls for shaping the cakes of firelighters, and a pilot plant was installed which had a production rate of 207 lighters per minute, 260,000 lighters per 21 hours. It was found that the naphthalene primer could not, with satisfaction, be incorporated in the mixture before rolling, but had to be fed into grooves made in the cake during the rolling operation.

The size of the individual firelighters was 4½ in. by 2¾ in. by 1 in. deep and the depth of the groove ¾ in., throughout the length of the cake. The pitch, sawdust, wood shavings and creosote were all mixed together in their correct proportions and the mixture delivered in a hot plastic state on to flat steel sheets on top of a roller track for delivery to the rolling machine.

The type of rolling machine used was a rotary press concrete slab machine, the roll being cut so that the naphthalene primer grooves and the grooving for the delineation of the individual firelighter cakes were made during the passage of the matrix under the roll. The speed of the steel sheets carrying the matrix to and under the roll was 8 ft. per min.

Immediately after passing from under the roll, the naphthalene primer grooves were filled with molten naphthalene supplied from an overhead tank fitted with spigots delivering to the grooves. The bore of the spigots was arranged for the filling of the grooves to coincide with the speed of the matrix on the conveyor. The primed firelighters continued their passage, on the original steel sheets on the roller conveyor, to the cooling station preparatory to dispatch.

For the production of 500,000 firelighters per day the following were the tonnages of materials needed:—Pitch 22.6 tons, sawdust 6.8 tons, wood shavings 11.3 tons, creosote 4.5 tons, naphthalene 8.1 tons, total 53.4 tons. The estimated cost of the plant was £25,000 and the labour needed for operation including maintenance and foremen, 111 women and eight men.

Biggest Contract Ever

THE BIGGEST single coke oven contract ever yet placed in the United Kingdom has been signed between Dorman, Long & Co. Ltd. and Simon-Carves Ltd. for the building of a new battery of 150 twin-flue compound coke ovens, together with by-product plant and coal and coke handling equipment, at the Cleveland Iron & Steelworks of Dorman Long at Middlesbrough.

The new plant will carbonise approximately 1,250,000 tons of coal a year to supply coke for two new blast furnaces with a joint annual capacity of 750,000 tons of iron. It will also enable Dorman Long & Co.'s present production of motor benzole to be doubled and will substantially increase the output of refined by-products.

This new construction forms part of Dorman Long's £36,000,000 five-year programme.

The Work of Consultants

Will Specialist Teams Predominate ?

TRENDS in consulting work were commented upon recently by Mr. C. J. Goodwin—who has had 40 years' experience in that field—in the course of an article published in *The Central*.

Before 1914, said Mr. Goodwin, consulting work usually included the design and construction of plant and factories, and a considerable staff of draughtsmen and assistants was necessary to prepare specifications and quantities, and to arrange for starting up and certifying contractors' costs.

A Relatively New Class

Now there has emerged a relatively new class of consultants, many of them highly specialised and covering new fields such as fuel technology, fibres, plastics, biochemicals, food, petrochemicals, insecticides, pesticides, industrial management, time and motion study, instrumentation, etc. Obviously, comments Mr. Goodwin, no individual consultant can be expected to give competent advice on projects which may necessarily involve attention to more than a few of these items in addition to his main preoccupation.

The large industrial groups can afford a trained technical staff, but even they employ outside consultants from time to time and in Mr. Goodwin's experience some of them have made good use of a small team of consultants to plan for the future and to assist their technical staff in appraising new developments and processes before contracts are let.

Few, however, of the smaller undertakings (which account for much more than half of the country's industrial productivity) can afford more than one consultant; some of them cannot afford even that and so rely to some extent on research associations.

The conclusion is inescapable, Mr. Goodwin contends, that many individual consultants will gradually find that they can only practise successfully either in partnership with others or preferably as a member of some sort of team of advisory specialists. The use of a team of specialists is not new and is no longer frowned upon, but there is still a fatal tendency to segregate them from the factory or plant and to expect them to produce ideas and wonders by intuition and without patient research and investigation.

New Reformer Building

A COMPLETELY new type of catalytic reformer is rapidly taking shape at the Pure Oil Company's Heath refinery at Newark, Ohio. Designed and being erected by the M. W. Kellogg Company, the reformer represents the first commercial installation of the special process developed by Kellogg to utilise the new regenerative platinum catalyst, RD-150.

The plant, according to Kellogg, will process 3,000 barrels of naphtha daily, converting the low (about 33) octane feed to high octane gasoline which will rate about 98 octane with 3 cc. of TEL. Provision has been made in the design for operation with high sulphur feedstocks, should crude market conditions dictate their use. The reformer is expected to be completed and in operation by June of this year.

Since its announcement less than a year ago, the new catalyst has excited interest throughout the industry for its promise of improved economies in the platinum reforming of low grade feeds. Because it is a regenerative type, the catalyst maintains a high activity over extremely long periods of time, resulting in low catalyst costs. Better yields of aromatic components are also among the advantages claimed for it. Furthermore, evidence from pilot runs indicates that it is adaptable to a wide variety of feed stocks.

Use of Soap Films

continued from page 832

other small alterations have improved the apparatus.

Thanks are due to the North Thames Gas Board for permission to publish this report and to Mr. P. A. Gibbons, who assisted with much of the work.

References

[1] Gooderham, W. J., *J.S.C.I.*, 1940, **59**, 1.
[2] *Idem, Analyst*, 1947, **72**, 520.
[3] *Idem, Analyt. Chim. Acta*, 1948, **2**, 452.
[4] *Idem, J.S.C.I.*, 1950, **69**, 377.
[5] *Idem, Chem. & Ind.*, 1953, 477.
[6] *Idem, Chem. & Ind.*, 1954, 121.
[7] Donnelly, R. P., and Broadbent, R., *J.S.C.I.*, 1950, **69**, S. 27.
[8] Spiers, H. M., Editor, 'Technical Data on Fuel.'
[9] Perry, J. H., Editor, 'Chemical Engineers' Handbook.'
[10] Gooderham, W. J., *J.S.C.I.*, 1938, **57**, 388.
[11] Shepherd, M., *U.S. Bur. Stand. J. of Research*, 1946 **36**, 313 ; 1947, **38**, 19, 491 ; *Anal. Chem.*, 1947, **19**. 635.
[12] Silver, L., BP. 638,608.
[13] Brubaker, D. W., and Kammermeyer, K., *Anal. Chem.*, 1953, **25**, 424 ; *Ind. Eng. Chem.*, 1952, **44**, 1465 ; 1953, **45**, 1148, 2342.

Gelatine: Preparation & Properties

by A. E. WILLIAMS, Ph.D.

GELATINE is often regarded as a refined form of glue, but although the two products are derived from the same classes of raw material—bones, skin, hide waste, etc. —there is little resemblance in the two when manufactured. Since gelatine is used in the food and pharmaceutical industries, it must be prepared to a high standard of purity; and its use in photographic emulsions again imposes a rigorous control of its manufacture. Impure forms of gelatine may be employed in the treatment of textiles and in paper-making.

Glue has been in use for over 3,000 years, but gelatine is little more than a century old. Its first application was in the food industry, and with the advent of photographic plates, and later the film, gelatine was found to be a convenient medium to carry the sensitive chemicals. Later the pharmaceutical industry made wide use of gelatine in the form of capsules to contain doses of medicine and drugs.

From Animals' Bones

The essential raw material for gelatine is collagen, which is contained in the bones, etc., of the animals; and the collagen may be hydrolysed by alkalis, acids, or enzymes to yield gelatine. It is possible to produce gelatine by heating collagen and water together under pressure. This procedure, however, is slow and it gives a discoloured gelatine, due to the high temperature involved; so that in practice the reaction is speeded up by the use of a hydrolytic agent and a much lower temperature is employed. Manufacturing control has to be exercised to prevent other reactions taking place between the gelatine already formed from the collagen and the hydrolytic agent.

The structure of the gelatine molecule is still imperfectly understood; the effect of heat, and the chemicals used in its preparation, gives gelatines of different properties. Molecular weight studies of gelatine in solution have been made.[1] Osmotic methods for the molecular weight determination gave figures characteristic of the gelatine studied, and independent of the solvent. From a commercial gelatine, fractions were obtained with molecular weights of from 15,000 to 250,000. Other investigators[2] show that specific rotation of gelatine gels is independent of concentration, decreasing with increasing temperature and decreasing molecular weight. Rigidity is proportional to the square of the concentration and decreases with decreasing temperature; its square root is a linear function of the molecular weight. These workers postulate that the change in optical activity accompanying gelation is due to intramolecular rearrangement; a small number of intermolecular links is responsible for rigidity.

A study has been made[3] of the degradation of gelatine prepared by the alkaline process and the acid process respectively, from which it is concluded that heat has rather more effect on the acid process gelatine. Both types show the least breakdown at neutrality, and heating at a high *p*H is more damaging than heating at a low *p*H. The extent to which the physical properties are destroyed is independent of concentration, but increases with rise in temperature at a rate which is rather more than in proportion to the temperature increments. The initial period of heating produces the greatest effects.

The loss of ammonia when gelatine is heated in the presence of alkali, titration figures on heated gelatine, and a knowledge of the method of preparation, have been used to develop a theory explaining the relation of the different kinds of gelatine to collagen. The action of enzymes on proteins has been the subject of much research in recent years and one group of investigators[4] claim the complete resynthesis of gelatine from its hydrolysis products by the use of trypsin at a pressure of 8,000 atmospheres.

Manufacture

The process of preparing gelatine on a commercial scale follows well-defined techniques which over a number of years have been found to give a high yield of pure gelatine. In most manufacturing methods about six months elapse from the time the bones or other raw material are put into process to the blending of the finished product. The stages of processing may be classed as treatment of the raw material with the hydrolytic agent—generally either lime or a mineral

acid—washing, digesting with water, filtration of the resulting weak gelatine solution, concentration of the solution, cooling to produce a solid gelatine, grinding and blending. The operation of blending is necessary to produce a final product which has standard properties from a raw material which may vary from batch to batch; and the blending process is facilitated by the fact that the gelatine is in powder form.

Assuming bones to be the raw material, these are crushed; the ground bone is then graded for size and quality; and the phosphate is extracted by treatment with a dilute solution of hydrochloric acid. This converts the basic tri-calcium phosphate into the soluble mono-calcium salt, to be run off and converted to di-calcium bone phosphate.

The material remaining in the acidulation tanks is ossein and this is water-washed to eliminate the last traces of the hydrochloric acid, after which it is transferred to liming pits where it is treated with lime and allowed to stand for some weeks. Other alkaline agents may be employed instead of lime, but the latter has the advantage that a detrimental strong alkali cannot be made with the lime at the temperatures used. As the soaking process proceeds, the collagen is gradually transformed to gelatine, and at intervals samples are taken to ascertain the proportion of gelatine present.

When the gelatine is judged to be at its highest concentration, the material is transferred to washing vessels (Fig. 1) in which the *p*H value of the material may also be adjusted by the addition of suitable chemicals. One object of the washing process is to ensure that the final product shall have a low inorganic content. A weak solution of gelatine is obtained by boiling the washed material in stainless steel tanks. This heat treatment also tends to discourage growth of bacteria.

The next step in the manufacturing process is the filtration of the weak gelatine solution, which is generally between 2 and 4 per cent strength. Filter media vary with the strength of the solution to be filtered; thus, a strong gelatine solution may be filtered through cotton pulp, and ordinary filter cloth with a filter aid may be employed for the weaker solutions.

The filtered solution is next evaporated to obtain a concentrated liquor that will set at normal temperatures. There are several types of British evaporating plant made specially for gelatine solutions, and the main feature of them all is a relatively large heating surface and provision for preventing loss of product through frothing. The moisture content of the gelatine leaving the evaporators is still much too high to enable a powder to be obtained, so that a drying process is necessary before grinding. As the liquor leaves the evaporators, it may be run into shallow vessels with cold water jackets to obtain a quick cooling. Where necessary, the *p*H is again adjusted so that it is always below 7.7. An acid gelatine is more resistant to the action of bacteria than is a neutral or alkaline one.

Drying of the gelatine may be accomplished by various types of drying plant, but it is always carried out at a comparatively low temperature. Grinding of the dried gelatine is usually done by means of a disintegrator, the ground gelatine being graded

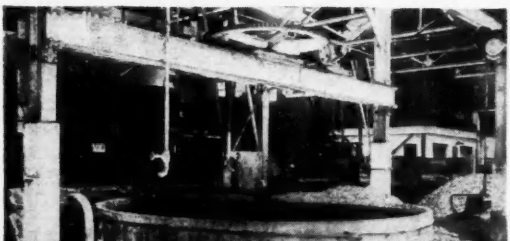


Fig. 1. Alcone washer in a gelatine factory

Courtesy of Edward Wilson & Son Ltd.

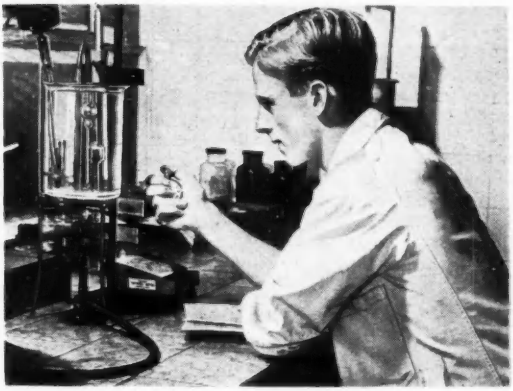


Fig. 2. Carrying out a viscosity test

Courtesy of P. Leiner & Sons Ltd.

by sifting, and finally blended with other batches to give a uniform final product.

Photographic Gelatine

A special batch of gelatine may be produced for a particular purpose. For example, a gelatine is sometimes required to have good resistance to heat, and this implies the incorporation of a hardener during manufacture. It has been recorded[5] that condensation compounds of dialkylamines and formaldehyde may be used as hardeners for gelatine and the resulting product has a high resistance to boiling water, and sometimes, depending upon the hardener employed, is plasticised. The reaction products of mono- and tri-alkylamines with formaldehyde do not have the same property.

One use for hardened gelatine is in the manufacture of photographic emulsions for coating plates and films; it enables these to be subjected to a certain amount of heat, such as rapidly drying the plate or film by moderate heat, without affecting the gelatine.

During investigations of the photographically active impurities present in gelatine, the preparation of a glucose-cystine from cystine and glucosamine hydrochloride has been described.[6] Substances like this are often the main cause of trouble in photographic gelatines. A 0.5 per cent solution of 2-thiobarbituric acid in 10 per cent acetic acid is suggested as a useful reagent for reducing substances. Other investigators have protected a method[7] of deactivating gelatine by treatment with a finely divided metal whose sulphide is insoluble, for example, platinum or nickel.

When a gelatine was in short supply, a few years ago, it compelled some photographic manufacturers to make use of new and untried grades of gelatine. To meet this situation a method of testing and classifying gelatines was adopted by certain concerns[8] and this method consists in ripening a series of simple silver chloride emulsions for different times with different concentrations of the gelatine and measuring the turbidity of each sample. The series of curves relating turbidity to concentration and ripening time is characteristic of the gelatine. Thus inert gelatines can be distinguished from those that retard grain-growth and those that give strong sulphur-sensitisation; the last giving a minimum in the turbidity-concentration curve.

These investigations showed the effect of removing the active constituents of an active gelatine and the effect of adding a sensitiser to an inert gelatine. It has been suggested in other quarters that the foregoing procedure should be supplemented by testing the gelatine not only in its natural state but also after removal of sensitisers and retarders.

Viscosity

The viscosity of gelatine solutions is of great significance in many applications and there are a number of factors which may influence the viscosity. For example, viscosity is affected by the method used in pre-

paring the gelatine, its *p*H value, the presence of other substances, temperature, and degree of dispersion. Gelatine is an amphoteric substance and it is possible to prepare it at the isoelectric point. At this point the viscosity for a given solution is very low, but it can be raised by the addition of suitable electrolytes and this almost invariably happens when the gelatine is put to use.

In considering the degree of dispersion of gelatine in water, one may regard the mixture as the dispersed phase, gelatine, and the dispersion medium, water. In this solution the viscosity will be governed by the particle size of the dispersed phase, other conditions being equal. By a rapid stirring of the solution, the particle size of the dispersed phase is reduced and there is an accompanying fall in the viscosity. Thus in the preparation of many gelatine-containing products, vigorous stirring of the gelatine solution has to be avoided in order to maintain a suitable viscosity. Of the various factors affecting the viscosity of gelatine, temperature is the most marked, and the viscosity falls rapidly upon heating above room temperature, and repeated heating and cooling permanently destroys the bulk of the viscosity.

In testing the viscosity of a gelatine, the temperature used is normally between 59 and 60° and several types of equipment are in use. Some of these are based on the results obtained by the resistance of the gelatine towards a solid object resting on it, while others record the time required for the gelatine to pass through a given length of capillary tube (Fig. 2, p. 837). Both the Engler and Ostwald viscosimeters make use of the capillary tube method.

For the preparation of low-viscosity gelatines a method has been patented[9] wherein gelatine is treated with a low molecular weight alkylamine at a *p*H between 8.5 and 10, at 90° to boiling point, over a period ranging from 15 minutes to 2 hours. It is stated that the viscosity is reduced without interfering with the jelly strength.

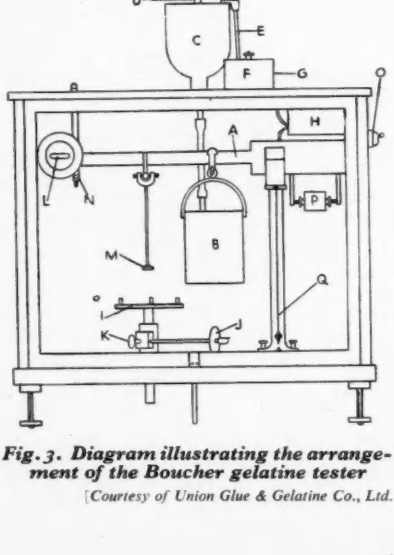


Fig. 3. Diagram illustrating the arrangement of the Boucher gelatine tester

[Courtesy of Union Glue & Gelatine Co., Ltd.

Jelly Strength

Jelly strength determines the capacity of a given gelatine solution for bearing a specific weight, and there are various types of instrument for determining this characteristic. One of these is the Bloom gelometer which is based on the principle of the resistance of the gelatine to a force applied to the surface. Probably the most simple and effective gelometer is the Boucher instrument (Fig. 3) wherein a 5 mm. depression in the surface of the sample is produced by a plunger 13 mm. in diameter. The force required to produce this depression is supplied by a known volume of water, each millilitre being equal to one 'jellogram.'

The test bottle containing the sample is placed on the table I, and raised until the plunger M just comes into contact with the surface of the sample, and the zero-indicating line is seen to be in the centre of the microscopic zero finder, L. The needle-valve D is then opened and water is allowed to run from the container C into the water receptacle B. From the diagram it is seen that the weight of water in this receptacle is transferred through the beam A to the plunger M, depressing the latter into the sample. When the plunger reaches a precise depression of 5 mm. the electric points at N make contact and immediately stop the water supply to the water receptacle.

The standard container to hold the gelatine has a capacity of 150 ml., diameter of the body inside is 56 mm., outside diameter being 60 mm., and the height is 82 mm. This wide-mouthed glass bottle takes a rubber stopper with a diameter of 42 to 45 mm.

In making a test, 5 grams of gelatine are weighed into the test bottle, 100 ml. distilled water are added and the bottle closed with the rubber stopper. The loaded bottle is then maintained at a temperature between 10° and 15° until the gelatine is completely swollen.

A normal powdered gelatine requires about one hour to accomplish this; the bottle is then placed in a thermostatically-controlled hot water bath and maintained at 65° for 10 to 15 minutes, during which the bottle contents reach a temperature of between 60° and 62°. The bottle is then inverted several times to obtain a homogeneous load, and it is allowed to cool to room temperature before placing in a chill bath having a temperature of 10° for 16 to 18 hours. Immediately after removing the sample from the chill bath the test is made on the instrument, so that the temperature of the sample will not have time to rise appreciably. The full nominal range of jelly strength expressed in 'jellograms' is from 4 to 500, but most samples tested are below 400.

Capsules

A gelatine capsule affords a convenient means of packing in an edible container a great variety of pharmaceuticals and food products; the contents of the capsule represent a carefully measured dose of the product. It probably provides the most exact form of oral dosage known, while at the same time affording protection against oxidation and contamination of the capsule contents. Capsules can be made a very attractive pack since they may be produced in any colour desired. The modern rotary die capsulation machine was invented in 1932 and since that time it has been perfected to the extent that it is now one of the most accurate manufacturing instruments in the pharmaceutical industry. One of these machines can produce up to 30,000 capsules per hour, with a fill tolerance of 0.5 per cent, and from a supply of gelatine of the appropriate quality and colour, the capsules are made, filled and sealed in one operation.

Two important factors in the process are the complete exclusion of air from the capsules, and with many types of product it is possible to fill with a very fine degree of accuracy. There are a large range of shapes and sizes available to suit different products; while the contents dosage may vary from 2 minims to 480 minims. This range of dosages, all of which can be produced on the rotary die machines, enables such diverse products as vitamins, and more bulky products such as veterinary preparations and insecticides, to be encapsulated at high speed. Over 90 per cent of the world's capsules are now made on the rotary die machines.

The colour of gelatine for capsule production is often an important factor, particularly where the capsules must have a standard light colour; when the capsule is to be coloured a deep red, the initial colour of the gelatine is not so important. The formation of colour in gelatine manufacture has been attributed to various causes, including the presence of mineral constituents. Some investigators are of the opinion that the presence of sugar in the gelatine from the collagenous raw material may influence colour formation. Colour in gelatine may be estimated either by the use of a Lovibond tintometer or by the EEL colorimeter. In most cases a highly purified gelatine will have a very light colour, due to the elimination of the impurities which cause the colour; but this is not always so, for darkening may occur due to overheating in the drying process after evaporation of the gelatine.

REFERENCES

[1] Pouradier, J., and VENET, A. M., *J. Chim. Phys.*, 1950, **47**, 11.
[2] Ferry, J. D., and Eldridge, J. E., *J. Phys. Colloid. Chem.*, 1949, **53**, 184.
[3] Ames, W. M., *J. Soc. Chem. Ind.*, 1947, 279.
[4] Bresler, S. E., Samsonov, G. V., and Selezneva, N. A., *Biochimia.*, 1949, **14**, 524.
[5] Brintzinger, H., and Hesse, B., *Kolloidzschr.*, 1949, **111**, 156.
[6] Steigmann, A., *Sci. Industr. Photogr.*, 1950, **21**, 10.
[7] Damschroder and Kauffman, USP., 2,449,980.
[8] Ammann-Brass, *Sci. Industr. Photogr.*, 1949, **20**, 441.
[9] Gates, J. W., and Huse, R. M., USP., 2,514,635.

Future of Electroplating

The Institute of Metal Finishing has announced that the Hothersall Memorial Lecture is to be given by Dr. William Blum (late of the Bureau of Standards, Washington) at a meeting to be held in the Crown Room of the Holborn Restaurant, Kingsway, London, W.C.1, on 20 April at 3 p.m. Dr. Blum, who is universally known in the plating industry, has chosen as his subject 'The Future of Electroplating.'

Match Restrictions Ended

IN a written Parliamentary answer this week, the President of the Board of Trade, Mr. Peter Thorneycroft, announced that the British Match Corporation has undertaken to carry out all the recommendations made by the Monopolies Commission last year and accepted by the Government.

He stated that a new agreement has been signed between the Corporation and the Swedish Match Co. Arrangements about quotas and compensation have been eliminated and there is no provision for sharing the British market. Further, there is no restriction on the expansion of the UK manufacturing capacity or on sales of matches. The Swedish Match Co. will in future decide the price at which Swedish matches will be sold in this country and not the British Match Corporation.

The Government did not accept a recommendation of the Monopolies Commission that it should supervise costs in the industry and control the price of matches.

Synthetic Rubber in UK

AN assurance that the recently announced plans of I.C.I., Dunlop and Monsanto Chemicals for manufacturing synthetic rubber in the UK (see THE CHEMICAL AGE, 1954, **70**, 726) will not compete with natural rubber in its normal uses was given in the House of Lords last week by the Earl of Munster, Under-Secretary to the Colonial Office.

He said the synthetic rubber projects in this country are expected to produce about 16,000 tons a year, or less than an 'insignificant' 3 per cent of the total output of Malayan natural rubber. The new projects were for highly specialised industrial application. The production of particular types included heat and oil resisting rubbers and another for soling shoes.

Science in Industry

A SURVEY which may be the means of bringing an increasing use of scientific knowledge and techniques into the smaller and medium sized industrial firms of Scotland is to be undertaken by the Scottish Council (Development & Industry).

The project, involving the use of a team of 'visiting scientific investigators' has been under consideration by the research and chemical committees of the council for some time and word has now been received that a grant will be forthcoming from the American counterpart aid scheme for an experiment to be undertaken.

When the forthcoming survey was announced in Edinburgh last week, Mr. W. S. Robertson, technical secretary of the Council, said the need was not primarily for more information, but for the better dissemination of existing information. If the survey produced positive results it would point the way for the establishment of a service of 'scientific visitors' on a permanent basis.

Sulphur Recovery Plant

A NEW and wholly automatic plant for producing sulphuric acid from smoke has recently been put into operation at the Boliden Mining Company's copper smelting works at Rönnskär in North Sweden. About one-third of the sulphur dioxide in the nearly 14,000,000 cu. ft. of smoke pouring out every hour from the 475-ft. stack, Europe's highest, is utilised in this way.

The plant, which has cost about Kr. 10,000,000 (£690,000), is the only one of its kind in Sweden. The present output, 90 tons per 24 hours, covers approximately one-tenth of Sweden's annual consumption of sulphuric acid, which is estimated at 350,000 tons. The growing use of sulphuric acid as a raw material in the chemical industry may call for an increase in the output, which is elastic within certain limits.

Price Reduction

BRITISH Industrial Solvents have announced that the price of 'Bisol' 2-ethyl hexanol has been reduced. The new schedule is as follows (all prices per ton, carriage paid UK):—

10 tons, spot or contract, in 40/50 gal. returnable drums	£304
1 ton, spot or contract, in 40/45 gal. returnable drums	£306
40/45 gal., spot or contract, in 40/45 gal. returnable drums	£309
10 gal. in free, non-returnable cans	£334
5 gal., in free, non-returnable cans	£344

Allowances of 10s. to 30s., depending on quantity, for bulk deliveries in road tank wagons, remain unchanged.

Oxygen Analysis

Continuous Methods Discussed

THE probiems of continuous oxygen analysis were discussed by Mr. R. S. Medlock at a joint meeting of the North Western Sections of the Institute of Fuel and the Society of Instrument Technology recently.

Previous methods, he said, had been based on the chemical properties of oxygen. For example, it had been measured by burning carbon and measuring the percentage of carbon dioxide in the products of combustion. Another method was burning oxygen with hydrogen and measuring the amount of water vapour formed by a reduction in volume on cooling the gaseous products. The third way was to burn the oxygen with alcohol at the surface of a heated filament and measure the rise in temperature of the filament. The fourth method was by measuring the temperature rise when oxygen and hydrogen combined at the surface of a catalyst. In recent years, considerable developments had taken place in the measurement of oxygen by virtue of its magnetic properties.

Demonstration

The magnetic susceptibility of oxygen was 140×10^{-9} cgs. units, which, although very small, was nevertheless at least one hundred times more than that of many common gases. A demonstration followed showing the magnetic properties of oxygen. A stream of oxygen was made visible by introducing smoke into the gas and it was shown how this stream was drawn into a powerful magnetic field. As the oxygen cooled and its density increased, the magnetic effects became much greater and members saw how liquid oxygen contained in a Dewar flask was strongly attracted to the poles of a permanent magnet.

Mr. Medlock then dealt with the principles of operation of any oxygen analyser working on the magnetic wind principle, and a demonstration was made to show the speed of response of such an analyser. In this case, there was a dead time of less than 1 second and a 63.2 per cent response of 14 seconds. The chief sampling problems, he said, were:—

(a) Air leakage in the plant; (b) air leakage in the sampling system; (c) high gas temperatures at the point of sampling; (d) dust contained in the gases; (e) the presence of tarry matter in the gases; (f) water compensation problems; (g) corrosion from acidic constituents in the sample gas; (h) problems of aspiration; and (i) timelags in getting the sample to the analyser.

It was bad principle, said Mr. Medlock, to maintain a sampling system and an analyser at a pressure less than that of the atmosphere.

The speaker then discussed the simple principles of combustion, emphasising the relationship between carbon dioxide, CO_2, O_2 and excess air and combustion efficiency. It was shown that the correct percentages of CO_2, O_2 or excess air depended upon many variables, including furnace design, type of fuel used and the state of subdivision of the fuel.

Soda Ash in Brazil

BRAZIL is likely eventually to become independent of foreign supplies of soda ash as a result of an interesting ceremony at Rio de Janeiro recently, when, in the presence of the President of the Republic and the French ambassador, representatives of the National Alkali Co. of Brazil signed contracts with the Comptoir International d'Achats et de Ventes a l'Etranger and the Societé Krebs & Cie. SA, of Neuilly-sur-Seine, France.

The contract with Comptoir was for financing the equivalent of $12,000,000 to cover the installation of a soda ash plant at Arraial do Cabo, Cabo Frio, in the state of Rio de Janeiro, while the contract with Krebs was for the construction of the plant. The planned annual production of the plant is 100,000 tons of soda ash, 28,000 tons of which will be for transformation into 20,000 tons of caustic soda. Since the contract-signing ceremony the President of the Republic has told Congress that the factory should be in production by 1956.

Change of Constitution

The Carbon Dioxide Co. Ltd. has ceased to trade as a separate company, the whole of its business having been transferred on 1 April to a new division of its parent company, The Distillers Co. Ltd. It will be conducted in the name of The Carbon Dioxide Co.—a division of The Distillers Co. Ltd. The management and staff remain the same.

British Association

Annual Meeting Plans Well Advanced

PRELIMINARY arrangements for the 116th annual meeting of the British Association, to be held in Oxford under the presidency of Dr. E. D. Adrian, O.M., P.R.S., from 1 to 8 September, have been announced.

The inaugural general meeting of the Association will take place in the Sheldonian Theatre on the evening of Wednesday, 1 September, when Dr. Adrian will deliver his presidential address on 'Science and Human Nature.' It is expected that the meeting will be preceded by a convocation of the University of Oxford for the conferment of honorary degrees.

On Thursday, 2 September, a number of addresses by presidents of sections will be delivered, including 'Recent Developments in High Energy Physics' by Sir John Cockcroft, and 'New Ideas in Chemistry' by Sir John Lennard-Jones. Discussions in section B (Chemistry) on that day will be concerned with 'The impact of new ideas on physical, inorganic and organic chemistry.'

Coal & Britain's Future

On Friday the chemistry section will discuss 'Coal and Britain's Future,' and on Monday, 6 September, the chemistry of natural products, and metallurgy. 'The Future of Herbicides' is to be discussed in the agriculture section on Monday. On Tuesday the subject will be 'Black Diamonds: New By-products from Coal and British minerals.'

During the period of the meeting temporary exhibitions of general or sectional interest will be arranged by a number of museums and science departments, and in the evening of Thursday, 2 September, the heads of departments have agreed to open the laboratories and arrange for special demonstrations.

Also on 2 September, the British Council will hold a small garden party at which overseas visitors will be able to meet a group of UK scientists. Another garden party is to be given jointly by the City and University on 3 September, and on the evening of that day the chemistry section is to hold its dinner.

It is hoped to arrange a dance for Saturday, 4 September, and the Ashmolean Museum will be open one evening.

A wide selection of excursions and visits is being arranged, but full details will not be available until August. Accommodation may be had in colleges, hotels or boarding houses.

All who intend to be present at the meeting are requested to register as early as possible on a form obtainable from the Association's offices at Burlington House, London, W.1.

Disinfectant Manufacturers

OFFICERS and executive committee of British Disinfectant Manufacturers' Association for the ensuing year were elected at the recent annual general meeting as follows:—*Chairman*, Sir Knowles Edge, Bt., (Wm. Edge & Sons Ltd.); *vice-chairman*, Mr. W. Mitchell (Hull Chemical Works Ltd.); *hon. treasurer*, Mr. Victor G. Gibbs (William Pearson Ltd.); *executive committee*, Mr. R. G. Bercham (Jeyes' Sanitary Compounds Co. Ltd.), Mr. P. J. Bovill (Newton Chambers & Co. Ltd.), Mr. J. H. Chapman (Reckitt & Colman Ltd.), Mr. W. A. C. Hall (Prince Regent Tar Co. Ltd.), Mr. H. Ibbetson (A. Ibbetson & Co. Ltd.), Mr. J. J. McAulay 'Cooper McDougall & Robertson Ltd.), and Mr. A. E. Berry (Milton Antiseptic Ltd.), *ex officio*; *hon. auditors*, Mr. A. Gale (Milton Antiseptic Ltd.) and Mr. F. C. Seager (William Pearson Ltd.). The secretary is Mr. W. A. Williams, Cecil Chambers, Strand, London, W.C.2.

Standard for Disinfectants

A NEW British Standard, BS. 2462, provides a means whereby a purchaser of black and white disinfectant fluids in bulk may identify fluids of good commercial quality. The fluids are of the coal-tar type and the standard covers five groups of black and six groups of white disinfectant fluids, grouped according to the nominal ranges of germicidal value and the method of testing employed.

The standard covers general composition and stability before and after dilution. Certain explanatory notes regarding the types, germicidal value and approximate order of dilution are included. Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 2s. 6d.

AN INTRODUCTION TO ELECTRONIC ABSORPTION SPECTROSCOPY IN ORGANIC CHEMISTRY. By A. E. Gillam and E. S. Stern. Edward Arnold (Publishers) Ltd., London. 1954. Pp. 283. 40s.

During the last twenty years or so much attention has been paid by preparative organic chemists to the use that may be made of visible and ultra-violet absorption spectra in the purification, identification and structural determination of organic compounds. Parallel with this development of interest on the part of the chemist has been a correspondingly great improvement both in accuracy and ease of use of the instruments—particularly those of a photoelectric type—available for absorption measurements.

The late Dr. Gillam was a pioneer in the use of electronic absorption spectra for the solution of structural and analytical problems in organic chemistry, and during his lifetime gave many lectures on this subject to his own students and to various chemical societies. The book seems to have developed out of these lectures, although its completion was interrupted by the untimely death of the senior author early in 1950.

The present book aims only at introducing the subject to the chemist of graduate level. The data on electronic absorption spectra are now so numerous and the literature is growing so rapidly that a complete review of the subject could not be attempted in this introductory volume. The material for discussion has been selected so as to present elementary principles and modern views of the absorption spectrophotometry of organic compounds, together with a number of its more important applications. The book is divided into three main parts. The first section deals with the laws of absorption spectroscopy and basic concepts of the subject, some experimental methods of determining absorption spectra in solution, the relation between colour and chemical constitution, and with origin of spectra. In the middle section the absorption of compounds containing particular chromophoric groups are discussed and analysed. These compounds have been selected so as to include typical and important examples from the aliphatic, aromatic, alicyclic and heterocyclic series. Reference is made in the final section to examples which illustrate the use of electronic absorption spectra in the identification of organic compounds (carotenoid pigments, anthocyanins, dyes, etc.), in the determination of organic compounds (e.g., of Vitamin A in liver oils), in the quantitative analysis of mixtures, and in the solution of problems relating to the structure of compounds (e.g. stereoisomerism).

An appendix gives details of literature and book references on absorption spectroscopy, and also of liquids suitable for use as spectrographic solvents. The book provides a most useful and interesting account of a very important modern technique now at the disposal of the organic chemist.—G.S.E.

LEHRBUCH DER ORGANISCHEN CHEMIE. By P. Karrer. 12th revised edition. Georg Thieme Verlag, Stuttgart. 1954. Pp. xx + 949, full cloth. DM. 59.70.

The appearance of 12 German editions since 1927, as well as translations into English, French, Italian and Spanish, gives an indication of the well-deserved popularity of Professor Karrer's 'Lehrbuch.' However, this unique and valuable textbook is not without its limitations. There are many undergraduates who buy only one general textbook in organic chemistry and it is doubtful whether this book supplies all their needs. The sections dealing with the basic facts of organic chemistry are sometimes rather sketchy, and the book contains so many pages on matters of secondary importance (obscure natural products, drugs and

dyes) that the undergraduate who is seeking to learn the grammar and basic vocabulary of the science may find it difficult to see the wood for the trees.

The book covers many subjects which are only treated very briefly in other general texts, and this makes it of real value to undergraduates and research workers alike. The sections on alicyclic and heterocyclic compounds are especially good, and the chapters on alkaloids (70 pages) and terpenes are outstanding. Throughout the whole book it is evident that the author is a practising chemist who has a gift for communicating his enthusiasm to others. The reviewer was fascinated by the many 'asides' giving interesting information which it would be difficult to find outside the periodical literature.

In the twelfth edition more space is devoted to the discussion of reaction mechanisms and electronic theory. On the whole, these new sections are disappointing as they are often obscure and sometimes incorrect. However, in all other respects, the book is thoroughly up to date. Modern reagents (e.g. trifluoroacetic anhydride and lithium aluminium hydride) and many compounds of recent interest (e.g. dicyclopentadienyl iron, cyclooctatetraene, tropolones and urea inclusion compounds) are discussed. This book can be strongly recommended to those who want to 'brush up' their general knowledge of organic chemistry. The index (55 pages) is excellent and many references to the book literature (but not to periodicals!) are given.

There are a number of minor errors. The structure of the trimer of glyoxal is given incorrectly (p. 258) and occasionally the printer has lost a bond. It is very difficult to picture the strainless conformations of the decalins from the illustration on p. 404. The periodic acid oxidations discussed on p. 341 give a dialdehyde and not a diacid. But these are only unimportant blemishes on an otherwise excellent book. The paper and binding are good.—J.C.P.S.

REVIEW OF TEXTILE PROGRESS. Volume 4 (1952). The Textile Institute, Manchester, and Society of Dyers and Colourists, Bradford. 1953. Pp. 560. 35s.

This book provides a review of progress in the textile and dyeing industries for 1952. Separate sections deal with the physics and chemistry of fibrous materials, fibre production, conversion of fibres into finished yarns, fabric production, colouring matters, colouring textiles, analysis, laundering and dry cleaning, building, engineering and industrial applications of textiles. The articles, written by experts in particular fields, are generally of high standard and of value in enabling the reader to obtain information regarding technological advances which may not be easily accessible in the literature. As a result of a new editorial policy, much of the overlapping in previous volumes has been avoided and though this volume contains at least as much information as the previous one it is 30 pages less in length.

The chemist will find much of interest in the section dealing with the physics and chemistry of fibrous materials occupying nearly one quarter of the book. It includes an article on the chemistry of cellulose and cellulose derivatives (Dr. T. P. Nevell), one on the chemistry of protein fibres (Professor J. B. Speakman) and a very good survey of the chemistry of synthetic polymer fibres (Dr. B. P. Ridge). The authors do not by any means restrict themselves to textile applications and much data of theoretical interest is given. Thus information regarding work on molecular structure, molecular weight, the preparation and properties of cellulose derivatives and the degradation and oxidation of cellulose is included.

Other sections of interest to the chemist include an account of work on azo-, metal-containing and anthraquinone dyes (Professor W. Bradley). Information of a more technological nature is provided in articles on the production of fibres from cellulose, the production of synthetic fibres, sizing, dyeing, printing, finishing of wool fabrics, finishing of fabrics other than wool and chemical testing. The articles on dyeing and finishing are very detailed and give much data of theoretical importance.

An article on industrial applications of textiles lists some of the uses of the newer synthetic fibres in chemical industry, among these being use for filter cloths, acid-resistant braids, acid-resistant clothing and anode bags. Adequate author and subject indexes are provided. The book is well bound and the publishers are to be congratulated on the fact that the price shows no increase on that of the previous volume.—W.R.M.

HOME

Chemical Society Subscription Reduced

At its annual meeting in Manchester last week, the Chemical Society decided to reduce the annual subscription from £3 10s. to £2 2s. Professor W. Wardlaw, who was elected president for the next two years, explained afterwards that this had been done to encourage young people to join the society, which will continue to provide lectures all over the country, the use of a unique chemical library and, above all, the means of exchanging chemical knowledge.

I.C.I.'s £10,000 Gift

Imperial Chemical Industries Ltd. have given £10,000 to the burgh of Stevenston to mark the coronation of Queen Elizabeth and the creation of the town as a Royal Burgh. Handing the cheque to the Provost on behalf of I.C.I., Dr. James Taylor stressed the long association between the town and the company. The money will be used to improve the amenities of the foreshore.

Duty on Hydrocarbon Oils

Answering a question in the House of Commons last week, the Financial Secretary to the Treasury, Mr. J. A. Boyd-Carpenter, said the cost to the Exchequer of a reduction of 6d. a gallon in the duty on hydrocarbon oils, allowing for some consequential increase in consumption, would be approximately £8,000,000 a year in the case of heavy oils used as fuel in diesel-engined road vehicles, and £42,000,000 a year in the case of petrol and other light hydrocarbon oils.

A Question of Salary?

The vacant position of head of the Department of Metallurgy at Birmingham Technical College has been advertised four times without one applicant coming forward. The post is in Grade IV of the Burnham scales for heads of departments in establishments for further education and carries a salary of £1,340, rising by increments of £25 to £1,490. Birmingham Education Committee has agreed that the post be upgraded to Grade V, for which the initial salary is £1,490, rising by increments of £25 to £1,640.

Tungsten Ores Dearer Still

As from 6 April the Ministry of Materials has increased its selling prices for tungsten ores of standard 65 per cent grade and ordinary quality as follows:—wolfram from 155s. to 165s. and scheelite from 150s. to 160s., both per long ton unit delivered consumers' works. This is the fourth time the Ministry has increased its selling prices for these ores since 26 March.

Graphite in Scotland

As soon as weather allows, testing work is to be started on graphite deposits above Loch Lochy, Invernesshire, with a view to their ultimate development on a commercial scale.

S.E. London Gas Grid

Work has started on a £950,000 scheme for linking together the South Eastern Gas Board's South London works to form a gas grid. The grid is expected to be completed by 1955 and when fully operative should make possible a saving of £250,000 a year in gas production costs. Some of the pipes are to be supplied by Stanton Ironworks Co. and Staveley Iron & Chemical Co. Ltd., while high-pressure volumetric governors are to be supplied by the Bryan Donkin Co.

Golf Tournament

The annual 18-hole bogey competition for the John Preston Golf Trophy will be played on Saturday afternoon, 24 April, at the Ashford Manor Golf Club, Middlesex. Entry forms are obtainable from Mr. J. J. Preston, John Preston & Co. Ltd., 64 Stanley Road, London, W.3.

£50,000 Laboratory Project

The Scottish Division of the National Coal Board have announced plans for a £50,000 laboratory project at Corstorphine, Edinburgh. The new centre will house the divisional laboratories, the headquarters of the Coal Survey and a special section devoted to studying the upgrading and cleaning of coal. A chemical laboratory section will be included so that advanced work can be undertaken on the many different types of coal produced.

OVERSEAS

Cheaper Magnesium

According to a message from Montreal, the Dow Chemical Co. has reduced prices of magnesium sheet and plate in Canada from 4 to 28 per cent. The company feels that magnesium will now be more competitive with aluminium. Although uncompetitive by weight, it is hoped it will be by volume.

Rhodesian Copper Refinery

A scheme to construct in the near future a £5,000,000 electrolytic copper refinery at Ndola was announced recently by the Roan Antelope Copper Mines Ltd. The refinery, which will require about £3,000,000 of capital, will have an initial capacity of between 55,000 and 60,000 long tons of electrolytic copper a year. Power will be drawn from the Rhodesian-Congo Border Power Corporation Ltd.

Evans Medical French Venture

Evans Medical Supplies Ltd., Liverpool, have announced that in order to develop further the sales of their products in France, a French company has been formed under the name of Laboratoires Evans SA.

More Aluminium in Austria?

The Aluminium Works at Ranshofen, Austria, hope to increase output during 1954 by 5,000 tons to reach a total of 43,000 tons. Contracts with Austrian electric power companies for the supply of surplus current will permit the works to run at full capacity.

Starch from Banana Stems

A process for the extraction of starch from the stems of the banana plant has been worked out at the Indian Central Food Technological Institute, Mysore. India's annual requirement of starch is in the vicinity of 200,000 tons. This quantity has never so far been manufactured inside the country. Investigations to find a suitable substitute for maize revealed the possibility of use of banana stems. These, after the fruit has been gathered, are cut and left to rot. Examination showed that after proper processing a banana stem can yield from one and a half to seven pounds of starch, depending on its size.

New Israeli Factory

Work has begun on the erection of a new electro-chemical factory near Acre, in Israel. The factory, which is owned equally by Israel and investors from Holland and France, will manufacture chlorine, plant-protection chemicals, and insecticides. About 100 workers will be employed when the factory begins production in the middle of 1955.

Newsprint from Bagasse?

From Havana it is reported that intensive studies continue to be made in Cuba on the use of sugar-cane bagasse as a raw material for newsprint and other papers. A US Department of Commerce expert has been lent to Cuba to assist in preparing a report on the feasibility of the undertaking. The Sugar Workers' Retirement Fund has offered to advance the capital for the establishment of a mill.

Turkish Chrome Production

Turkey is now the world's fourth largest chrome producer, according to a claim recently made by the Department of Mines. A considerable quantity of Turkey's chrome comes from the mines at Guleman and there are other chrome deposits in Kutahya, the Eskisehir, Denizli, and Marmaris regions. Production has increased in recent years as follows:—1950, 346,536 tons: 1951, 602,220 tons; 1952, 670,000 tons.

Change of Name

The name of Crystal-Laporte Pty. Ltd., Botany, N.S.W. (the Australian subsidiary company of Laporte Industries Ltd., London) has been changed to Laporte Chemicals (Aust.) Pty. Ltd., the parent organisation having recently acquired the whole of the issued capital of the Australian company, whose authorised capital has been raised to £300,000. Extensive additions are being made to the plant at Botany to keep abreast of the ever-expanding demand for hydrogen peroxide and sodium perborate. The company will continue to act as Australian selling agents for Laporte Chemicals Ltd., Laporte Titanium Ltd. and Laporte Acids Ltd.

· PERSONAL ·

PROFESSOR W. WARDLAW, who has been elected president of the Chemical Society for two years in succession to PROFESSOR C. K. INGOLD, is professor of physical chemistry, University of London (Birkbeck College), and scientific adviser to the Appointments Department of the Ministry of Labour & National Service. Other elections announced at the annual meeting of the Chemical Society last week were as follows:—Vice-presidents who have not filled the office of president, PROFESSOR E. R. H. JONES, PROFESSOR R. P. LINSTEAD and PROFESSOR H. W. MELVILLE; treasurer, MR. M. W. PERRIN; ordinary members of council: DR. E. A. BRAUDE, DR. H. M. N. H. IRVING, DR. E. J. BOURNE, PROFESSOR H. D. SPRINGALL, PROFESSOR H. N. RYDON, DR. C. C. ADDISON, PROFESSOR J. M. ROBERTSON and DR. V. C. BARRY.

DR. WALTER P. KENNEDY, B.Sc., Ph.D., F.R.F.P.S.G., L.R.C.P. and S.E., F.R.I.C., F.R.S.E., joined The Distillers Company (Biochemicals) Ltd., as medical adviser, on 1 April. Dr. Kennedy was formerly senior medical officer at the Ministry of Health.

MR. H. W. CREMER, C.B.E., M.Sc., F.R.I.C., M.I.Chem.E., the distinguished consulting chemical engineer, and MR. C. S. SALMON, M.C., M.Sc., Lecturer in Chemistry, King's College, have been elected Fellows of King's College. Mr. Cremer is chairman of the Chemical Engineering Research Committee of the Department of Scientific and Industrial Research, a past-president of the Royal Institute of Chemistry and a past-president of the Institution of Chemical Engineers.

Holders of more than 98 per cent of the issued ordinary share capital of Pest Control Ltd. having accepted the offer made by Fisons Ltd. to acquire the ordinary shares, the board of Pest Control has been reconstituted. COLONEL R. P. W. ADEANE (former chairman) and MR. O'NEIL-DUNNE have resigned, while MR. F. G. C. FISON, MR. D. J. BIRD and MR. A. WORMALD (directors of Fisons) have been appointed to the board; MR. F. G. C. FISON has been elected the new chairman of the company, and MR. D. J. BIRD and DR. W. E. RIPPER (formerly managing director) have been elected vice-chairmen; MR. A. WORMALD, who has been appointed managing director, will retain his position as commercial director of Fisons.

Presentations have been made to DR. J. W. ARMIT to mark his retirement from the position of chairman of the Wilton Council of Imperial Chemical Industries Ltd. At a dinner in honour of Dr. Armit, MR. A. T. S. ZEALLEY, group director of I.C.I. Ltd., said that the new Wilton works would stand as a monument to Dr. Armit. MR. C. M. WRIGHT, personnel manager of I.C.I. Billingham Works, has been appointed Dr. Armit's successor, and DR. A. M. MCKAY has succeeded Mr. Wright at Billingham.

The names of three American scientists who will shortly receive top awards for outstanding contributions in nutrition research were announced this week. DR. L. A. MAYNARD, director of the School of Nutrition, and professor of biochemistry at Cornell University, will receive the Osborne & Mendel Award—a $1,000 cash prize—while the Borden Award in nutrition—a $1,000 cash prize and a gold medal—will be shared by DR. ARTHUR H. SMITH, professor and head of the department of physiological chemistry at the College of Medicine, Wayne University, and DR. AGNES FAY MORGAN, of the University of California.

Several new appointments affecting the executive staff of Henry Wiggin & Co. Ltd. are announced. They take effect on 1 May. MR. J. O. HITCHCOCK will relinquish his position as assisant managing director of the Wiggin Company to assume the position of 'Assistant to the Chairman' of the Mond Nickel Co. Ltd. He remains a member of the Wiggin board. MR. H. W. G. HIGNETT, superintendent of the Mond Nickel Company's development and research laboratory, has been appointed to the Wiggin board and will take charge of technical (metallurgical) control and development in all the Wiggin

plants. He is succeeded as superintendent of the laboratory by MR. H. EVANS. MR. R. E. ANSELL, manager of the sales department, now becomes a member of the Wiggin board. MR. O. LEWIS JONES will become general production manager, responsible for production in all the Wiggin plants. He is succeeded as works manager at Birmingham by MR. C. E. WINFIELD.

Some changes at the Zenith Works, Glasgow, are also announced. The general manager, MR. A. B. GRAHAM, will relinquish this position on 1 July but will continue with the organisation to undertake special duties in connection with production. He will be succeeded as works manager at Zenith by MR. R. J. P. MACDONALD.

MR. ERIC STEIN, chairman of the chemical group of The Distillers Co. Ltd., has been co-opted as a member of the council of the Association of British Chemical Manufacturers.

MR. A. C. J. BURNINGHAM has been appointed an additional director on the main board and deputy managing director of British Chrome & Chemicals Ltd. MR. J. LAURIE and MR. T. WILLIAMS have been appointed special directors. MR. CARLTON REYNOLDS has been appointed secretary to the company.

MR. S. A. BRAZIER, technical manager of Dunlop's general rubber goods division in Manchester, has been appointed technical consultant of the division. He continues his membership of the company's development and research board and of the local board of the general rubber goods division. His duties as technical manager will now be shared by MR. E. H. HURLSTON, factory technical manager, and by MR. F. W. WARREN, deputy technical manager, who becomes development manager in charge of laboratories. Mr. Warren is also appointed to the local board of the general rubber goods division.

Mr. I. M. O. Hutchison, sales director of the Balfour group of engineering companies, has arrived in New York on the first stop of the four months' round-the-world air tour which takes him to America, Canada, New Zealand, Australia, Tasmania and South Africa, with the object of consolidating and furthering the interests of the Balfour group—Henry Balfour & Co. Ltd., George Scott & Son (London) Ltd., and Enamelled Metal Products Corporation (1933) Ltd.

MR. EAN C. BAILLIE, C.A., of Layton-Bennett, Billingham & Co., has been appointed a director of Howards & Sons Ltd., and Howards of Ilford Ltd. MR. EDWARD G. ROONEY, of The Charterhouse Investment Trust Ltd., has been appointed a director of Howards & Sons Ltd.

MR. E. F. MACTAGGART, B.Sc., A.R.C.S., M.I.Chem.E., having sold his interest in Sondes Place Research Institute, Dorking, Surrey, of which he has been the director for the past seven years, has resigned from the board of Mactaggart & Evans Ltd. Before moving to Dorking, Mr. Mactaggart was in partnership with the late Mr. W. Edmund Evans, having founded the consulting firm of Mactaggart & Evans in 1936. His temporary address is c/o Midland Bank Ltd., Dorking.

Obituary

The death has been announced of DR. FRITZ LONDON, the German-born American theoretical chemist. He was 54. Last year he was awarded the Lorenz Medal for scientific achievement by the Royal Netherlands Society.

The death occurred at Wilmington, Delaware, on 5 April, of MR. PIERRE DU PONT, formerly chairman of the family firm of E. I. du Pont de Nemours. Mr. du Pont, who was 84, had been with the company for 50 years when he retired from the chairmanship in 1940. Beginning as a chemist at the age of 20, he rose from one executive position to another and was president until 1919, when he became chairman of the board, holding that position for 21 years before retiring when he was 70. Mr. du Pont was a son of Mr. Lammot du Pont, who preceded him in the control of the firm. He graduated in chemistry at the Massachusetts Institute of Technology in Boston. He always maintained a close association with the Institute and for many years was a member of the governing corporation.

Publications & Announcements

TO commemorate 75 years of service to industry, Thomas W. Ward, Ltd., of Albion Works, Sheffield, have published a book, 'Outline of Progress,' which describes in plain, undramatised fashion the growth of the Thomas W. Ward group of companies from small beginnings up to the present day. Well illustrated, the survey tells how the parent business was founded in Sheffield by Thomas W. Ward in 1878, when he was only 25. The sale of domestic coal and coke was the company's sole concern at first, but it expanded steadily until it was supplying all manner of minerals and raw materials needed at that time by iron-masters and foundries over an ever-widening area. Before the century was out, the organisation was engaged in such varied activities as ship dismantling, industrial demolition, and supplying machinery and industrial steelwork. Now it is essentially a manufacturing organisation, its activities including the provision of all types of plant and equipment for public works and other contracting. A limited edition of the book has been distributed.

* * *

NAMES and addresses of agents and manufacturers of some 4,500 chemicals in Holland, and Dutch agents of overseas manufacturers, are listed in 'Chemicalien Adresboek,' published by Bureau voor Bedrijfsdocumentatie, Hilversum. The third edition, 1954, has just appeared. Chemicals are listed alphabetically in Dutch, but there is an English index.

* * *

NON-SETTING paints which retain indefinitely a semi-plastic condition have been in use for some time in conditions where the primary requirement has been impermeability to moisture in addition to anti-corrosive properties. A typical use has been in the protection of water-sealed gas holder lower lifts. Recent investigations have revealed other applications. Such paint is now being used by a shipping company as protective treatment for wire-ropes and for making water- and air-tight seals to inspection plates and covers. Several tanneries have found that a non-setting coating successfully resists the highly corrosive atmosphere of acid alkali bath yards where hides are soaked preparatory to hair scraping. Non-setting paints, having semi-plastic characteristics, do not crack and, in fact, are absorbed by the pores in the steel surface. Aspinalls (Paints) Ltd., of Carleton, Skipton, Yorkshire, the manufacturers of 'Humidine,' have compiled some interesting data on the subject, which is available on application.

* * *

VOLUME I of 'Die Chemische Industrie der Schweiz und Ihre Nebengebiete,' published last year by Verlag für Wirtschaftsliteratur GmbH, Zürich, listed chemical manufacturing companies in Switzerland, and apparatus suppliers. Volume II lists the chemical products of the country (heavy and fine chemicals, plastics, pharmaceuticals, cosmetics, essential oils, cleaning materials, paints, cements, plant protection products, tar compounds, animal, mineral and vegetable oils, waxes, pyrotechnics and technical gas) and their suppliers, in German, French and English. An additional section gives complete information on the wholesale trade in chemicals, with details of imported and exported specialities. The price of the volume is £2.

* * *

SERIOUS failures of copper domestic hot water cylinders, due to dezincification of seams where brass brazing rod had been used, led Cuprocyl Ltd., 230 York Way, London, N.7, to investigate their own products. As a result, they are able to announce that trouble-free and durable cylinders are now available, brazed with silver-copper-phosphorus, and that the recent installation of 'Argonarc' and 'Argonaut' welding equipment has enabled them even further to dispense with brass for brazing.

* * *

STYRENE Co-Polymers Ltd. have now developed a new series of cheaper styrenated alkyd resins. The new range is designed to fulfil requirements where cost is a more important consideration than the unique colour retention exhibited by the standard 'Scopol' range. Typical instances where non-yellowing properties are not of such paramount importance include automobile primer-surfaces, undercoats, and general industrial finishes. Designated the 'D' series, this new planned and co-ordinated

range consists of three resins—D.71X, D.61X and D.51X. Each of these has its counterpart in the existing 'Scopol' range, the only differences being in solids content, non-yellowing properties and lower price. Excellent compatability characteristics allow the paint manufacturer complete freedom, it is claimed. By using the resins either singly or in the form of blends, he can formulate exactly the type of product he requires. While the 'Scopol' range is based upon a mixture of tobacco seed and dehydrated castor oils, the 'D' series is based upon a mixture of linseed and chinawood oils. Each of the new resins has a solids content of 70 per cent. Lower xylol contents allow more latitude in the use of cheaper solvents for further dilution.

* * *

AMONG recently declassified reports from AERE is 'The Theory of the DC Electromagnetic Flowmeter for Liquid Metals,' by J. A. Shercliffe, Department of Engineering, University of Cambridge, which investigates theoretically the variation of the ratio voltage output (flow quantity x field intensity). Copies are obtainable from HMSO, price 4s. 6d.

* * *

THE rational designing and planning of new laboratories with the embodiment of contemporary ideas is playing an increasingly important part in the life of the chemist today. Ralph Cuthbert Ltd., Westgate, Huddersfield, claim to have gained considerable experience in many kinds of laboratories and they have just published a supplementary catalogue describing their latest cupboard and drawer units, wall benches, fume cupboards, titration units, etc. A recent development is the use of 'Pyrex' glass for waste pipes from sinks to receivers or main drains. These combine the advantages of visibility, cleanliness and resistance to corrosion and are described in a leaflet issued by the company.

* * *

THE part that chemists and chemical engineers have played and are playing in the development of the Atomic Energy Research Establishment at Harwell is explained by Sir John Cockcroft in the course of an interesting article on Harwell in the March issue of *Atomic Scientists' Journal*, the journal of the Atomic Scientists' Association. Other features include 'The Utilisation of Fission Products,' by G. N. Walton.

CONTAINED in No. 21 of the *B.C.U.R.A. Quarterly Gazette* (an official publication of the British Coal Utilisation Research Association), is the Second Coal Science Lecture, delivered under the title 'Coal as a Source of Chemical Raw Materials' by Dr. R. Holroyd, research director of I.C.I. Ltd., following the third annual luncheon.

* * *

TO cover the increase of railway charges which came into operation on 1 March, The Railway Shipping & Publishing Co., Ltd., 12 Cherry Street, Birmingham 2, have published a completely revised edition of their 'Class Rates Section of Standard Charges.' The rates shown cover all classes of goods from Classes 1 to 20 and in addition to the station-to-station rates, the collected and/or delivered rates are given for Classes 11-20. Any present day standard rates may be seen at a glance for any destination up to 750 miles. The cost of the publication is 15s. (post paid).

* * *

THE Dewlite lamp now being marketed by the Dalzell Electric Welding Co. Ltd., Bellshill, Scotland, is a two filament incandescent lamp divided into two parts, each of a different colour, the colour being changed at will by the turn of a switch. The lamps can be supplied in any two-colour combination desired and as the two filaments can be switched on separately the two colours can be shown either separately or simultaneously. Intermingling of the two colours is prevented by a screen between the two sections of the bulb. The lamps can be manufactured in voltage to suit any requirements and the two sections need not be of equal wattage. The advantages of the Dewlite lamp for signalling in industry will be appreciated and numerous other applications readily suggest themselves.

* * *

THE excellent performance of resorcinol-formaldehyde resins for the assembly gluing of wood has led to increased interest in adhesives of this type. Aero Research Ltd., Duxford, Cambridge, claim that if the criterion of performance is to be durability in severe conditions, it is possible to achieve equally successful results with the more simple and much less costly 'Aerolite' 300 urea-formaldehyde resins. The latest issue of their 'Aero Research Technical Notes' (Bulletin No. 134) is devoted to notes on the properties and uses of 'Aerodux' 185.

Some of these materials are used in the treatment of water — for softening or demineralising: others have been developed specially for such applications as the separation, purification or concentration of aqueous and non-aqueous solutions.

A typical example in current use is the removal of metals and acids from swill water in the plating industry, thus allowing the same water to be continuously recirculated and reused. In addition to effecting a considerable reduction in swill water consumption, this process eliminates the problem of disposing of large volumes of contaminated water: it also makes possible the recovery for reuse of valuable materials.

ION EXCHANGE may supply the answer to your process problem. We should be happy to advise you if you will let us have details.

The **PERMUTIT** Company Limited, Dept. V.A.188, Permutit House, Gunnersbury Avenue, London, W.4 CHIswick 6431

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Satisfaction

CHANCE BROTHERS LTD., Smethwick, glass manufacturers. Satisfaction, 2 March, £650, part of £2,615, etc., registered 12 September, 1952 (40 Forster Street, Smethwick, having been released from the charge); also satisfaction, 2 March, £2,500, part of £3,380, etc., registered 12 September, 1952 (28 Rectory Gardens, Solihull, having been released from the charge).

New Registrations

Scott Laboratories Ltd.

Private company. (531,036.) Capital £100. Manufacturers, processors, importers and exporters of all kinds of chemical and pharmaceutical products, etc. Directors: Peter Scott and Seymour Cooper. Reg. office: 9 Violet Hill, Maida Vale, London, N.W.8.

Propane Fertilisers Ltd.

Private company. (531,003.) Capital £1,000. Manufacturers of and dealers in chemicals, fertilisers, etc. Directors: Rudi Sterberg, Hans Ford and Wilfred King. Reg. office: Sterling House, 8 Heddon Street, London, W.1.

Xylocaine Ltd.

Private company. (531,015.) Capital £2,000. Manufacturers of and dealers in chemicals of all kinds, etc. First directors not named. Reg. office: 4 Copthall Avenue, London, E.C.2.

Radcliffes Chemists Ltd.

Private company. (530,708). Capital, £500. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: Ernest Radcliffe and Jean T. Radcliffe. Reg. office: 74 Shaw Road, Oldham.

Highfield Lead Mills Ltd.

Private company. (531,173.) Capital £100. First directors not named. Solicitors: Bartley Cocks & Bird, Liverpool.

Delorme Ltd.

Private company. (530,737). Capital, £1,000. Consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: Lillian Melamed, Harold Tann and Ting Cheung Chan. Reg. office: 172 Fleet Street, London, E.C.4.

Millroom Accessories & Chemicals Ltd.

Private company. (530,703). Manufacturers of and dealers in chemicals, gases, drugs, natural and synthetic plastic substances, etc. First directors to be appointed by the subscribers.

Company News

Albright & Wilson Ltd.

A preliminary statement of profit made by Albright & Wilson Ltd. during the year ended 31 December last shows that group profit (including outside interests) before taxation, but after all charges, totalled £1,782,570, compared with £1,526,518 for the previous year. On 29 March the directors declared a second interim dividend of 12½ per cent and this dividend will be recommended as a final dividend, making 17½ per cent for the year.

Bowmans Chemicals Ltd.

In a statement issued with the accounts of Bowmans Chemicals Ltd. for the year ended 31 October last, the chairman, Mr. E. G. Turner, says that although the board does not yet recommend the payment of a dividend on the ordinary shares, it is hopeful that some distribution, 'albeit of a modest amount,' may be possible in the current year. The directors report profits for the year amounting to £20,440 after providing £15,820 for depreciation and £4,000 for taxation. This compares with a loss of £26,739 for the previous year.

The Pyrene Company

A final dividend of 12½ per cent is announced by the Pyrene Company. This makes a total of 22½ per cent for 1953 as compared with 20 per cent forecast when blocks of ordinary and preference shares were offered to the public last September. The 1952 dividend was 17½ per cent. The preliminary statement for 1953 shows that profits rose from £510,324 to £574,016, but due to heavier tax charge, which includes provision for EPL at £80,000, the net profit is down to £191,444, compared with £193,232.

Next Week's Events

MONDAY 12 APRIL

Society of Chemical Industry

London: Chemical Society's Rooms, Burlington House, Piccadilly, 5.30 p.m. Crop Protection Panel annual general meeting. Chairman's address by R. A. E. Galley.

TUESDAY 13 APRIL

Society of Chemical Industry

London: Chemical Society's Rooms, Burlington House, Piccadilly, 6 p.m. Plastics & Polymer Group annual general meeting, followed by Dr. R. J. W. Reynolds: 'Relation Between Chemical Constitution & Properties of Polymers.'

WEDNESDAY 14 APRIL

Institution of Chemical Engineers

Birmingham: Chemistry Lecture Theatre, The University, Edgbaston 6.30 p.m. Graduates' & Students' Section (Midlands Centre) annual business meeting followed by film display.

Society of Chemical Industry

London: Chemical Society's Rooms, Burlington House, Piccadilly, W.1, 6.30 p.m. Food Group annual general meeting, followed by address by G. S. Bishop (Under Secretary, Ministry of Food): 'The Storage & Distribution of the Nation's Food.

London: Chemical Society's Rooms, Burlington House, Piccadilly, 6.15 p.m. Food Group annual general meeting.

Midlands Society for Analytical Chemistry

Birmingham: Mason Theatre, The University, Edmund Street, 7 p.m. Dr. T. S. West: 'Solvent Extraction in Inorganic Analysis.'

Liverpool Metallurgical Society

Visit to John Summers & Sons Ltd., Shotton.

SATURDAY 17 APRIL

Chemical Society

Dundee: University College (Chemistry Department), 7 p.m. Royal Institute of Chemistry lecture. Dr. S. J. Green: 'Change of Scale of Chemical Reaction.'

Market Reports

LONDON.—Active trading conditions have been reported on most sections of the industrial chemicals market. There has been a steady intake against contracts and new orders for home delivery continue to cover good volumes, while overseas demand, mainly from Commonwealth outlets, is reasonably good. Prices generally are unchanged and show no decided trend although lower quotations have been announced for such items as penicillin and Bisol-2-ethyl hexanol. On the other hand, as reported last week, lead compounds are slightly dearer with the increased price of metal. Among the coal tar products there is a persistent demand for the solvents, refined tar and creosote oil, and cresylic acid is moving well on home account.

MANCHESTER.—Steady to firm price conditions have obtained on the Manchester market for heavy chemical products during the past week. A satisfactory feature is the persistent pressure for supplies under contracts, the alkalis and a wide range of other products being prominent in this respect. Additional inquiries and actual fresh bookings have been on a fair scale. Most descriptions of fertiliser materials, including superphosphates, sulphate of ammonia and the compounds, are going steadily into consumption. There has been little change on the week in the position of the tar products, a good demand for which, with an odd exception, being reported.

GLASGOW.—As opposed to the very brisk demand which has been experienced for the past weeks, the period just past has been somewhat quieter, with the exception of the usual standard lines which are always in demand. Prices, particularly for lead salts, have been somewhat erratic and the reduction in price of several solvents is welcomed. Despite the slight falling off in trade the week has been satisfactory.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

ASSISTANT CHEMISTS required for Laboratory in East End :—
(1) For routine testing of wide range of chemicals ;
(2) Research Assistant to work mainly on development problems ; preferably with some experience of pilot plant operation.
Inter B.Sc., H.N.C., or degree standard.
Reply, giving full details of education, background and experience, to **BOX No. C.A. 3303, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

TO YOUNG GRADUATE ENGINEERS—CHEMICAL AND MECHANICAL

BROWN & POLSON, LTD., food manufacturers, invite applications for the following posts to be filled this year in their manufacturing division at Paisley and Manchester, from young men who
(**A**) have graduated and completed National Service ; or
(**B**) will graduate this year, having completed National Service ; or
(**C**) will complete National Service this year, having graduated.
CHEMICAL ENGINEERS (3). For training in production and process control.
MECHANICAL ENGINEER (1). For training in maintenance, construction design and installation of plant. A thorough planned practical training will be given with good starting salary and general employment conditions. Opportunities are there for the men who can seize them in this old-established expanding organization.—Replies, giving details of age, education, National Service, experience (if any), and when available for employment and interview, to **GROUP PERSONNEL MANAGER, WELLINGTON HOUSE, STRAND, LONDON, W.C.2.**

EXPERIENCED CHEMIST required for interesting work in the **LABORATORY** of well-known company of chemical engineers and plant fabricators in corrosion resistant metals. At present situated in S.W. London and Crawley, Sussex. The successful candidate will be expected to take an interest in all chemical problems arising from above activities, and the work demands a wide general knowledge of applied chemistry together with flair for original investigation. Superannuation and profit-sharing schemes in operation. Housing might be arranged if required. Commencing salary depends on age and qualifications but will be up to £1,000 p.a. Applications in own handwriting to be sent to **THE LABORATORY MANAGER, THE A.P.V. CO., LTD., WANDSWORTH PARK, S.W.18.**

LARGE CHEMICALS WORKS in **HOME COUNTIES** require young, active men who have completed their National Service commitments, to train for shift supervisory duties in the factory. Minimum standard required is General Certificate or equivalent in Chemistry, Mathematics and English. Salary according to age, qualifications and experience. Canteen facilities. Pension Scheme. Apply **BOX No. C.A. 3301, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating ; also lumps ground and granulated; established 1830 ; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS : "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

FOR SALE
2,600 feet
6 in. **M.S. FLANGED PIPING**
B.S. Class B.
FLANGES B.S. Table E.
IMMEDIATE DELIVERY
MADEN & McKEE, LTD.,
317, PRESCOT ROAD,
LIVERPOOL, 13.

NEW STEEL DRUMS all sizes and types, immediate delivery from Continental production. Write or phone **STEEL DRUMS LIMITED, 118, BURDON LANE, SUTTON, SURREY.** Vigilant 4886.

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.
TWO DE LAVAL SEPARATORS, VEE-BELT DRIVE. Good condition.
THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET, LONDON, E.14. TEL. EAST 1844.

7 BRAND NEW Jacketed **STERILIZING VESSELS**—7 ft. long by 3 ft. diam., complete with fittings.
2—18 in. **KEK PLATE MILLS**, complete with feeders, delivery bins, motors and entablature.
9—Worssam **ROTARY PRESSES.**
POWDER DRESSING OR SIFTING MACHINES.
1—Johnson **FILTER PRESS**—47 plates, 32 in. sq.
1—Johnson **FILTER PRESS**—30 plates, 25 in. sq.
Wood **FILTER PRESS**—69 plates, 2 ft. 8 in. sq.
24 in., 30 in. and 36 in. **HYDRO EXTRACTORS.**
Heavy Cake **CRUSHING MILL**—2-pair high, by Nicholson.
"U"-shaped Horizontal Jacketed **MIXER**—7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven.
3—5-roll **REFINERS** by Baker Perkins.
1—No. 1A Water-cooled **CIRCULATOR MILL.**
2—Excellent Nickel-lined Jacketed **TILTING PANS.**
5—Excellent Porcelain **DISC MILLS.**
1—Very Fine **GARDNER SIFTER and MIXER,** trough 5 ft. 9 in. by 24 in. by 28 in. deep, with wood-built hopper, elevator, A.C. motor and starter.
2—**GARDNER** 'G' size **SIFTERS AND MIXERS.**
2—**GARDNER** 'H' size steam jacketed **MIXERS.**
6—**JOHNSON FILTER PRESSES** 30 chamber 24 in. square.
RICHARD SIZER, LIMITED, ENGINEERS, HULL.
Telephone : 31743.

69 **FLAX MATERIAL BAGS** for 42 in. Broadbent underdriven centrifuge.
62 **DITTO** for compartmented 48 in. Watson Laidlaw overdriven centrifuge.
Brand new, unused.
CHIEF ENGINEER,
THE BRITISH DRUG HOUSES, LTD.,
GRAHAM STREET,
CITY ROAD, N.1.

FOR SALE

600

SPECIAL PURCHASE OF MODERN DRYING PLANT

TEN NEW AND UNUSED TWIN ROLL SPRAY DRIERS with rolls 40 in. long by 32 in. diam., suitable for 60/80 lb. sq. in. W.P., fitted spray discs and air-cooled scrapers. Main drive for rolls is by 7 h.p. A.C. motor through reduction gearbox. Drier fitted with enclosed work discharge conveyors with ancillary equipment embracing two motor-driven air blowers, motor-driven 1½ in. diam. stainless steel pump, jacketed feed tank approx. 54 in. by 37 in. by 26 in. deep, and motor-driven dresser for dried material, comprising 4 ft. long by 12 in. diam. phosphor bronze mesh covered screen, with spiral distributor to bagging-off outlet.

FOUR NEW AND UNUSED VACUUM DRYING OVENS of mild steel welded construction, approx. 7 ft. long by 3 ft. 6 in. wide by 3 ft. 6 in. deep, fitted nine steam-heated shelves to carry thirty-six acid resisting metal trays, 36 in. long by 16 in. wide by 1¾ in. deep. Davit swung door at each end, with hand-wheel closing mechanism. Oven complete with set of thirty-six trays, motor-driven horizontal wet vacuum pump, pressure and vacuum gauges, and connecting piping.

FOUR NEW AND UNUSED WET AND DRY HORIZONTAL VACUUM PUMPS, type P.N.6, single-stage, double-acting type. Capacity approx. 200 cu. ft. per minute displacement at speed 125 r.p.m. Fitted outboard bearing with driving pulley, approx. 12 h.p. required to drive.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel.: Pudsey 2241.

TWO NEW MILD STEEL JACKETED PANS approximately 150 gallons capacity. 100 lb. working pressure. **G. & A. E. SLINGSBY, LTD., HULL.**

MORTON, SON AND WARD, LIMITED
offer
MIXERS

"MORWARD" "U"-TROUGH Mixers and Drying units in sizes up to 3 tons.

MIXERS, Horizontal or Vertical, Jacketed or Unjacketed, made to requirements. Several in stock.

3-cwt. Trough **MIXERS** by **CHALMERS** and **GARDNER.** Stainless steel lined troughs.

JACKETED PANS

ONE New 250g. in stainless steel. Others made to requirements in stainless steel or mild steel, with or without mixing gear.

500g. Jacketed **AUTOCLAVE** with detachable cover. 150 lb. in jacket.

500g., 300g. and 200g. **AUTOCLAVES** in mild steel riveted construction, with detachable covers.

CENTRIFUGE by **SHARPLES,** motorised, bowl speed 15,000 r.p.m. 300 g.p.h. As new.

TANKS

Lead-lined, cylindrical and totally enclosed in 75g. and 100g. sizes.

PUMPS

A large selection of **MONO** and other Pumps in stock, 2 in. to 6 in. New and second-hand.

INQUIRIES INVITED.
MORTON, SON AND WARD, LIMITED,
WALK MILL,
DOBCROSS, NR. OLDHAM,
LANCS.
'Phone: Saddleworth 437.

FOR SALE

C. BARBER, LTD.

C.I. FILTER PRESS, 32 in. square plate and frame type by **MANLOVE ALLIOTT** with hydraulic closing gear. 40 chambers giving cake capacity of 40.3 cu. ft. New and unused.

500-gal. Over-driven M.S. **MIXING VESSEL.** M.S. pressure filter, 4 ft. 3 in. diam. by 5 ft. 3 in. overall height.

C.I. FILTER PRESS, 25½ in. square, by **MANLOVE ALLIOTT,** plate and frame type, 13 chambers, arranged for washing. Excellent condition.

CANNON STEAM JACKETED ENAMEL-LINED PANS, 10 and 25 gallons. All new and unused.

DOULTON 25-gal. **COPPERS** with lids. **NEW** and unused.

WELDED VESSELS of all types, in mild steel or stainless. Fabricated to customer's specifications.

C. BARBER LTD.
SILVERDALE GARDENS
HAYES MIDDLESEX
Telephone—Hayes 2735/6

PHONE 98 STAINES

1,500 gal. **ALUMINIUM ENCLOSED CYLINDRICAL TANK. DITTO** (two) 600 gal. With loose lids.

100 gal. **ENCLOSED S.S. MIXER,** 220/1/50. (Water jacketed.)

JACKETED "U"-TROUGH MIXER/DRYERS, 6 ft. 3 in. by 2 ft. 3 in. by 2 ft. 7 in.

STAINLESS STEEL ENCLOSED ELEVATOR/CONVEYOR, 40 ft. long.

30, 40, 60 and 100 gal. **WELDED STEEL CYLINDRICAL JACKETED MIXERS,** 400/3/50.

(Twelve) **"Z"-BLADE MIXERS** up to 36 in. by 30 in. by 26 in. deep.

DITTO 20 in. by 19 in. by 16 in. **JACKETED, VACUUM, TILTING TYPE.**

PUMPS, CONDENSERS, HYDROS, AUTOCLAVES, STILLS, OVENS, DRYERS, BOILERS, etc.

HARRY H. GARDAM & CO., LTD.,
STAINES.

SACK AND BAG MERCHANTS AND MANUFACTURERS. New and reconditioned for Home and Export. (Use **JUTEX** for sack repairing). **ALTRINCHAM JUTE LTD., WRIGHT STREET, BROADHEATH, ALTRINCHAM, CHESHIRE.**

TWO FILTER PRESSES by Johnson, 40 in. square plates with centre feed. 29 plates. Hand and hydraulic closing gear.

THOMAS MITCHELL & SONS LIMITED, BOLTON.

---

600 KW. HEWITTIC GLASS BULB MERCURY ARC RECTIFIERS complete with Mains Transformer and Breco Regulator. Output 80/300 volts D.C.—Further details from: **WHITEFIELD MACHINERY & PLANT LIMITED, COBDEN STREET, SALFORD, 6.** Tel.: Pen. 1373/4.

WANTED

WANTED—STAINLESS STEEL STORAGE TANKS, 1,000 to 2,000 gallons capacities. Glass lined might suit. **BOX No. C.A. 3302, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SERVICING

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD.
Plantation House,
Mincing Lane,
London E.C.2

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

PULVERISING of every description of chemical and other materials for the trade with improved mills, wharfage, and storage facilities. THOS. HILL-JONES. LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.

WET AND DRY GRINDING, Micronising, Grading and Mixing of Minerals and Chemicals for all trades. Also suppliers of ground zircon, sillimanite, fused silica, precision casting materials and a wide range of ground minerals.
W. PODMORE & SONS, LTD.,
SHELTON, STOKE-ON-TRENT.
Phones STOKE-ON-TRENT 2814 & 5475

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).
Auctioneers, Valuers and Fire Loss Assessors of CHEMICAL WORKS PLANT AND MACHINERY
York House, 12 York Street Manchester.
Telephone 1937 (2 lines) Central Manchester.

EXPORTS

EXPORTS in a Buyer's Market. A commonsense approach is in the customer's own language. Increase your exports to the rapidly expanding markets of Latin America by using INDUSTRIA BRITANICA, the leading British monthly trade journal published in Spanish and Portuguese editions. Specimen copies and details of free translation and other services available on request to: INDUSTRIA BRITANICA, BOUVERIE HOUSE, FLEET STREET, E.C.4.

WORKING NOTICES

THE Proprietors of Patent No. 616260 for IMPROVEMENTS IN AND RELATING TO CATALYSTS FOR POLYMERISATION AND CONDENSATION OF HYDROCARBONS, desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

THE Proprietors of Patent No. 631325 for MANUFACTURE OF HYDROCARBONS, desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

THE Proprietors of Patent No. 632291 for IMPROVEMENTS IN METHODS OF DEHYDROGENATING ALIPHATIC HYDROCARBONS, desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

THE Proprietors of Patent No. 632350 for IMPROVEMENTS IN OR RELATING TO DEHYDROGENATION CATALYSTS AND METHOD OF PREPARING SAME, desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

THE Proprietor of Patent No. 648406 for PROCESS FOR MAKING ORGANO-SILICON COMPOUNDS desires to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

THE Proprietors of Patent No. 651297 for PROCESS OF RECOVERING SULPHUR FROM PYRITE FINES desire to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to HASELTINE LAKE & CO., 28, SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.2.

INDEX TO ADVERTISERS IN THIS ISSUE

Printed in Great Britain by THE PRESS AT COOMBELANDS Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 10 April, 1954. Registered at the General Post Office, Entered as Second Class Matter at the New York, U.S.A., Post Office.